SEASIDE PLANTING

A. D. WEBSTER

FOR SHELTER, ORNAMENT & PROFIT

£15.

Alan C. Thompson

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SEASIDE PLANTING

FORESTRY WORK

By W. H. WHELLENS

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Forestry in the past has been greatly neglected by succeeding Governments, but it is to be hoped that in future encouragement and help will be given to landed proprietors to plant all available land not suitable for agriculture. The Government, too, will in all probability take over large areas of waste land for afforestation. This will provide work for thousands of men, a large proportion of whom will be ignorant of the work. Mr. Whellens's volume describes in detail the actual work connected with the different branches of forestry, and should be of use both to the "apprentice" forester and also to gentlemen who do not employ a forester, but who have land to plant and are in doubt as to the method of doing so. Experienced foresters, too, will find the tables in the appendix useful for reference.

T. FISHER UNWIN, LONDON

Pinus Insignis by the Seaside.

(*See page 54.*)

SEASIDE PLANTING

FOR SHELTER, ORNAMENT, & PROFIT

BY

A. D. WEBSTER

Author of "Practical Forestry," "A Forester's Diary," "Town Planning," etc., etc.

WITH THIRTY-FOUR ILLUSTRATIONS

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PREFACE

Owing to the insular position of the British Isles, tree planting along the coast, whether for shelter, ornament, or profit, is imperative. Though in the matter of sheltering and ornamenting residential property much has already been done, yet there still remain vast tracts of uncultivated land by the seaside that are capable of being converted into thriving woodlands. Not only so, but the shelter afforded by such would prove of great benefit to the adjoining agricultural lands.

The war has sadly depleted our home supplies of timber, and in order to keep pace with our requirements and provide trees for the future, planting on a large scale, both by the seaside and on waste inland situations, is imperative and will require to be taken in hand at an early date.

This book has been written in order that the possibilities of seaside planting and benefits therefrom, both in a direct and indirect way, may be appreciated.

The Illustrations are mainly by Mr. Wallis, Kew.

SEASIDE PLANTING

INTRODUCTION

THOUGH seaside planting, particularly with reference to sand-dunes, has, both in this country and on the Continent, been engaged in from an early date, yet it is only of comparatively late years that the reclamation of waste lands by the seaside has been carried out in a systematic manner and on an extensive scale. Probably the earliest record is in 1307, at which date dunes on the coast of the North Sea were planted with the maram or sand grass. In 1510 a proclamation was issued by Maximilian of Austria regarding the planting of the maram on sandy seaside wastes; and in 1567 an official edict was prescribed by the Government of Holland as to the planting of this grass on the coastal dunes. By the middle of the sixteenth century considerable tracts of drifting sand both in Denmark and Northern Germany were reclaimed by planting. At Tidsvilde, in Denmark, during 1738 the drifting sand was fixed by planting the dunes with maram, and a monument to Roehl, who carried out the work, may be seen at that place. In the public archives at Copenhagen a

document is preserved on which it is stated that the Danish King resolved in 1779 that every citizen should plant a certain area of sand-drift with maram grass, detailed instructions being given as to the mode of planting. As early as 1754 one of the North Frisian Islands was planted with the maram and other seaside plants, and a map of the reclaimed area is in existence. Reclaiming the Landes of France was started in 1788 by Bremontier, with the effect that much of that inhospitable region has been converted into thriving plantations and fertile fields. In our own country during the fifteenth and sixteenth century small areas of shifting sands were dealt with along the eastern coast of England and Scotland, though at an even earlier period it is on record that attempts were made at reclaiming sandy ground on the southern coast of England.

In the reign of William III. so greatly esteemed were the lyme and maram grass for fixing shifting sands by the sea coast that the Scottish Parliament of that period considered their destruction a penal offence; and the same provision was extended to the coast of England by the British Parliament during the reign of George II. Spurn Head, at the mouth of the River Humber, is an exposed sand-bank that at an early date was firmly fixed by these grasses, and to which fact it is possible we owe the existence of the town of Hull. It was not, however, till about the middle of the sixteenth century that seaside planting was engaged in on an extensive scale in this country. The Holkham sands were successfully planted by Lord Leicester, and a memorial to Coke, of Norfolk, who

superintended the work, was erected there in 1848. Other extensive planting operations by the seaside were carried out on the Culbin sands, in Morayshire, by the Firth of Forth, at Margam and other places in Wales, and along both the eastern and western coast of Ireland.

Where Bournemouth now stands was less than a century ago a desolate and treeless tract of heathland, but the passing of the Christchurch Enclosure Act in 1802 was quickly followed by extensive tree planting and binding the shifting sands with suitable grasses. To-day matters are widely different, and Bournemouth is now the principal health resort on the South Coast, this mainly owing to the beautiful and hygienic pine-woods with which the town is surrounded.

Though much has already been done towards reclaiming barren wastes by the seaside, yet there are still vast areas of sandy and marshy coast-land that both from a hygienic and economic standpoint could be profitably utilised in bearing a crop of timber; and, as will be gathered from the following chapters, both home and Continental experience warrant us in recommending the greatly extended culture of trees and shrubs along our coast-line, whether for shelter, ornament, or utility.

Seaside Planting.

When we consider that the coast-line of the British Isles extends to fully 7,000 miles, and that the cultivation of the adjoining land is almost entirely dependent on the shelter provided, the necessity for tree planting in order to counteract the direct

influence of the sea-blast will be recognised. Where long stretches of shifting sands occur, such as in Norfolk and many parts of Wales and Scotland, the reclaiming of these by a well-organised scheme of tree planting is to be strongly recommended, while the ornamenting of residential property by the seaside is equally deserving of attention.

That such work can be successfully carried out we have ample proof, not only in this country, but on the Continent, where vast areas of shifting sands have been planted along the coast of France, Belgium, and Holland.

But, as well as sand, the planter by the seaside in this country has often to contend with rocky and gravelly soils, as well as such as are largely composed of chalk, peat, loam, or clay. Mud flats and marshy grounds are also abundant.

The situation of the sea-front has much to do with the successful formation of plantations; far less difficulty is experienced on the western than on the eastern coast of England and Scotland, which may be accounted for by the fact that in the former case the influence of the Atlantic and the warm Gulf Stream has a softening effect on the air when compared with the cold northerly winds that assail the eastern coast. Several trees and shrubs that are cultivated on the western coast of Scotland cannot survive when planted along the eastern side, though at much lower latitudes.

Our Continental neighbours have certainly taught us a lesson in the perseverance with which they have overcome many difficulties in the way of reclaiming and planting barren, sandy

wastes by the seaside, where the soil was of the poorest description and quite unfitted for the growth of any agricultural crop.

The coast of France presents a good object-lesson in this way, where vast tracts of shifting sands have been converted into thriving plantations, and from which the Government receive an annual return of over a million pounds sterling. In the Department of the Landes and Gironde thousands of acres of sand-hills have been planted during the past sixty years, which have not only improved the economic and agricultural condition of the district, but created a most important industry in timber, tar, resin, and turpentine. For a distance of 120 miles between the estuaries of the Gironde and Adour tree planting has been most successfully carried out. In 1811 a Commission was appointed by the French Government to report on the result of experimental plantations that had been formed along the Gulf of Gascony on a monotonous succession of sandy wastes that were entirely destitute of vegetation. The report was favourable, and since that time extensive planting operations have been carried out along many parts of the coast.

The State Government of Belgium has done excellent work in reclaiming many of the sand-dunes which extended along their coast, and when the returns from such work are taken into account the results are simply marvellous.

The year before the war the writer examined and reported on these plantations, and was particularly impressed with the health and vigour of the trees, both young and old, but particularly those that had been planted along the exposed coast from

Zeebrugge to the frontier of Holland, and where the rolling sand-hills often exceed 60 feet in height and, as at Duinberg, rise one behind the other in rapid succession. In Holland, too, the judicious carrying out of planting operations by the coast has been amply rewarded, the trees used being a protecting row of elm, ash, and maple facing the sea-breeze, behind this poplar, willow, lime, chestnut, and walnut; while for underwood the elder, sloe, and sorbus have been successfully employed. Along the shores of the Baltic, also, much of the shifting sands has been successfully reclaimed and planted.

Some of the most successful planting by the seaside that has been carried out in this country is at Holkham, in Norfolk, where fully exposed to the cold, cutting winds that blow in from the German Ocean. Here in loose, shifting sands many kinds of trees have been established, and are highly remunerative. On high ground close to the Yarmouth Road and near Southport, where the soil was on a poor gravelly bottom, equally good results have been brought about by tree planting. The reclamation of the Culbin sands on the coast of Morayshire by afforesting is another excellent object-lesson of what can be done by a well-directed scheme of tree planting. The Culbin sands, which extend for about four miles by two miles between the mouths of the Nairn and Findhorn, and at an altitude of some 200 feet, are for the most part a dreary waste of shifting sands, beneath which some of the best land of the country lies buried. In 1694 about 3,600 acres of profitable arable land were overwhelmed by a severe storm, and the beautiful estate was in

Plantation of Austrian Pine on the South Coast.

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a few days rendered absolutely worthless by the depth of sand with which it was covered. Taking hope by the reclamation of similar sandy dunes on the coast of France, the owners of the Culbin sands set to work, and by dint of perseverance and a well-directed system of planting much of these dunes have been partially reclaimed by afforestation.

But many other cases of successful tree and shrub planting by the sea-coast could be pointed out, such as in the Isle of Anglesea and along the Carnarvonshire coast, where thriving plantations now occupy the site of what sixty years ago were barren, treeless wastes of shifting sands. At Margam, in South Wales, excellent results have followed seaside planting.

In Ireland, too, especially the north and south-west, much good work has been carried out in the way of reclaiming large areas of wind-tortured shore-lands.

CHAPTER I

SAND-DUNES AND COAST EROSION

THE gradual erosion of the sea-coast which is going on in many parts of the country is a menace that is difficult either to avoid or deal with in a satisfactory manner.

Along many parts of the south coast, as also in Norfolk and Suffolk, and in Wales and Ireland, the process of coast erosion is going steadily, though in some cases slowly, on, and in several instances not only houses and villages, but whole parishes, have been submerged, and in at least one well-authenticated case land has receded about 110 feet during the past ninety years.

In Scotland, with reference to the extensive sand wastes of Moray, Hugh Miller, the great geologist, said he had wandered for hours amid the sand wastes of this ruined barony, and seen only a few stunted tufts of withered branches occupying amid utter barrenness the place of what, in the middle of the seventeenth century, had been the richest fields of the rich province of Moray.

More than a thousand acres of land extending to a length of fully four miles were covered by sand drifts at Santon, in

Norfolk, in 1668. Sand-dunes have, however, been known to act in a beneficial way, and have been taken advantage of in stopping coast erosion; and some forty years ago a large tract of land on the coast of Wales was successfully reclaimed by influencing the forces of Nature where it would have been hopeless to stand up or fight against them. As sand is only blown landward where there is no barrier or obstacle in the way, so it follows that sand-dunes have their origin or usually begin by the gradual accumulation of sand against fences or walls, trees, grasses, or other vegetation. The sand-dunes at Southport, in Lancashire, which extend for upwards of twenty miles, are known to have been formed naturally during the past 350 years, and in 1690, where now there is a belt of dunes nearly three miles wide, no sand-hounds are known to have existed. Originally the Holkham sands were planted by Lord Leicester for ornament and shelter, but, owing mainly to the binding action of the sea matweed and other grasses, and consequent accumulation of sand, a formidable barrier to the inroads of the sea has been gradually brought about. Some 200 acres of the sands that were planted with the Austrian and other pines act as a shelter to the adjoining agricultural land, and in the matter of timber production have exceeded all expectations.

A fitting memorial to Coke, of Norfolk, who may be regarded as the pioneer of sand-dune reclamation, was erected in 1848 by the tenants and occupiers of the adjoining lands.

The Goswick sands, in Northumberland, present features that are of particular interest to those who study the reclama-

tion of waste lands by the seaside. Mablethorpe is another example.

When giving evidence before the Royal Commission some interesting facts regarding sand-dunes and coast erosion were recorded by Sir H. Rider Haggard and other witnesses. Sir Rider mentioned that at his own house, near Lowestoft, the coast was formerly subject to erosion, and considerable areas of land were lost to cultivation in consequence. Now the sand has accumulated at the foot of the cliffs, and, having been kept in position by the valuable maram grass and other vegetation, forms a most effective barrier. But numerous cases of an almost similar kind could be mentioned in which, by directing the course of the shifting sand, formidable barriers of a permanent and useful type have been brought about. Along the coast of Kent many acres of land that were at one time submerged at high tide are now covered with vegetation, and act as a capital barrier to the fine sand and gravel that are being constantly forced inwards by the wind and tide. It is both interesting and instructive to watch the formation of sand-dunes, where the incoming drift is stopped by a barrier of earth or vegetation.

About 1805 the landowners around Bournemouth imported a large quantity of *Pinus Pinaster* from the Landes, in France, to plant in dry, gravelly soil by the coast where the Scotch pine was not satisfactory.

Along the coast between Hythe and Dover erosion of the chalk cliffs is going on slowly but surely, and many of the

martello towers, which were originally well back from the water, have now been undermined, and in some instances completely washed away, by the incursion of the sea. Large quantities of the chalk cliffs are also annually toppling into the sea.

The average recession of the cliff face between Bournemouth and Boscombe is from 12 to 18 inches per annum. Near the seaward extremity of the double dykes stands a monument that during the past fifty years has been moved inland on three occasions. The removal at each time was 50 yards, giving a loss of 150 yards in depth of land in half a century.

The more formidable the barrier, the quicker the dune will increase in size and begin to march seaward. When prevented from being blown inland the sand heaps itself on the already formed dune, where it is held in position by the maram and other binding grasses, aided along many parts of the coast by the viper's bugloss (*Echium*), sea or horned poppy (*Glaucium*), sea heath (*Frankenia*), sea holly (*Eryngium*), and hosts of other maritime plants.

Several interesting and highly instructive experiments in fixing blowing sands were carried out on the Margam Estate in South Wales. The field of experiment extended along the coast from Morfa Colliery to the farm of Morfa-bach, a distance of over two miles and covering an extent of some 1,200 acres.

On the land side barriers or fences of boards, wattled

hurdles, and branches were erected, but so powerful was the wind that the sand accumulated and collected in ridges till the top of the fence was reached, when it rolled on as before. Seed-sowing was resorted to, many bushels of broom and grasses were sown, but the few that germinated and produced young plants soon perished by reason of the ever-shifting sands. Prickly comfrey was recommended and failed; then sackfuls of seeds of nettles, dock thistles, and other seeds were sown, but all to no purpose, the sands sweeping on as before. As a last resource the sand grass (*Elymus arenarius*) was transferred from other parts of the adjoining coast and planted over the ground at distances of from 3 to 4 feet apart. Planting was carried out by means of an iron-pointed dibble; this implement is 4 inches in diameter, and makes a hole about 15 inches deep. In each hole a tuft of grass, subdivisions from old, established plants, was inserted, and filled in and tightly tramped. Each tuft had some roots attached, and was inserted to the depth of the pit. Planting was successfully carried out during the autumn months, and as late as April in the following spring.

No better object-lesson on the reclaiming effects of sand-dunes, when properly directed, can perhaps be pointed out than along the Belgium coast from the town of Duinberg to the frontier of Holland. For days the writer wandered amongst these sand-hills, which are of all elevations up to 600 feet, and the adjoining plantations of the mountain and cluster pine, and watched with interest the reclaiming hand of Nature in clothing with vegeta-

tion the leeward slopes of these mountains of sand. The Landes of Gascony, which extend to 1,700,000 square miles, are other notable examples of what may be accomplished in the reclaiming of the waste by well-directed efforts in staying the incoming sands.

CHAPTER II

PREPARATION OF THE GROUND AND PLANTING

"BETTER a wee bush than nae bield" is a Scottish saying that forcibly applies to tree planting along the coast.

The chief consideration in seaside planting is unquestionably shelter, for it may be noticed everywhere along our coast that wherever the direct force of the wind is broken there trees and shrubs thrive best. Few persons other than those who have actually been engaged in the work can form an idea of the many difficulties that are to be encountered in the formation of belts and plantations on exposed and wind-swept shores. To plant young trees around most parts of the coast of the British Isles, particularly where wide stretches of open seaboard are to be dealt with, without preparation of the ground and the erection of shelter or wind screens, is in most cases hopeless work and productive of the most unsatisfactory results. In seaside planting many classes of soil and different situations will have to be dealt with, and various methods employed according to the requirements of each.

Roughly speaking, the sea-coast of the British Isles may be divided into the following soil classes :

1. Shifting sands.
2. Chalk or limestone.
3. Gravelly.
4. Peat and mud flats.
5. Rocky.
6. Clay or stiff loam.

As the preparation and planting of these soils is different in most cases, it has been considered advisable to treat each separately.

Shifting Sands.—These are not only the most frequent, but probably the most difficult to deal with of any seaside grounds ; and though barren sand-dunes of large extent are of rare occurrence in this country, yet small stretches of fine sand that is easily shifted by the wind are common along our coast.

Before commencing planting operations on the sandy and exposed sea-coast the preliminary step is to erect a barrier of some kind which will not only intercept the violence of the wind, and to some extent relieve it of its saline particles, but act as a screen or shelter to the young trees. For this purpose various kinds of erections have been used, and are equally suitable ; but the most common in this country, where shifting sands have to be dealt with, is a strong paling two-bar fence thatched with brushwood. When the writer examined and reported on the planting of the sand-dunes in France and Belgium, he had ample

opportunity of observing the various methods adopted in these and other countries. In France, where enormous quantities of sand are thrown up along the coast, a continuous paling fence is erected to bar its progress. This fence is made of stout planks about 5 inches wide by $1\frac{1}{4}$ inches thick fixed to posts which project above ground-level for about $3\frac{1}{2}$ feet. The pales or planks are placed with intervals of from 1 to 2 inches between each, through which the sand drifts and serves as a blocking or support to the fence. As a sand-bank rises and the fence becomes buried the planks are lifted up by means of a lever and hook. In Belgium wattle fences are employed, as also those made of furze and branches of trees.

In the formation of seaside plantations along the coast of the British Isles we have found, as before stated, the most suitable wind-screen to be a strong paling fence thatched with brushwood. The posts, which are 6 feet above ground and 12 feet apart, are connected by two horizontal bars arranged at 2 feet and 5 feet from the ground. Against this are placed fir or gorse trimmings, 6 feet high if possible, and kept in position by being firmly tied to the cross-bars by means of wire or stout tar rope. Gorse has been found not only more lasting, but better suited for wind-screen purposes than the branches of fir or other trees. This wind-barrier has been found far preferable to a wall or mound of turf and soil, the wind being broken up and sifted in passing through it, and, what is of great utility, relieved of its saline particles to a large extent. One of the most difficult situations to cope with

is where the ground is low-lying or rising landwards with a gentle slope, and fully exposed to the storm blowing direct from the sea—a difficulty that can only be successfully overcome by first erecting a suitable screen as above recommended.

Immediately behind this wind-barrier the best trees to plant are the cluster, Austrian, and mountain pines (*Pinus Pinaster*, *P. Laricio*, *P. austriaca*, and *P. montana*), following up with evergreen oak, several species of willow and poplar, and the common sycamore. Of shrubs, the most suitable are the sea buckthorn (*Hippophaë rhamnoides*), tamarisk (*Tamarix germanica*), furze, broom, elder, creeping willow (*Salix repens*), and snowberry. The maram grass or sea matweed (*Psamma arenaria*) and the sea lyme grass (*Elymus arenarius*) have excellent qualities for reclaiming sandy soils by the sea-coast.

From an early date we find that the maram was highly valued on account of its sand-binding properties. So valuable were the services rendered by the maram that in the reign of Elizabeth an Act was passed prohibiting persons from destroying it, the Act being renewed in the reign of George II. Sowerby, in his "Grasses of Great Britain," drew attention to the devastating effects of the wind-borne sand in certain parts of the country, and to the value of sea grasses, the maram in particular, in giving stability to sand by the sea-coast. He says: "Its economic value is of no trifling amount, as thousands of acres of fertile land adjoining the low, sandy parts of our coast must within a few years be reduced to almost hopeless sterility were it to be removed. To form an adequate idea of the

Sea Buckthorn, one of the best Seaside Shrubs.

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distressing effects produced upon cultivation by the drifting of sea-sand we must visit districts liable to its inroads, and notice during the prevalence of high winds the manner in which it is borne by their resistless force inland."

But not only as a sand-binder is the maram valuable, but it contains a large quantity of silica, and by reason of its fibrous texture is in demand for the making of mats and ropes. At Forres, on the west coast of Scotland, a tract of valuable agricultural land of more than ten square miles was completely inundated by blown sand, houses, orchards, and fields being buried. In this case it is well known that the calamity was brought about by the thoughtless pulling up of large tracts of the maram grass which bound the surface of the sand-hills in that neighbourhood. Other instances of a similar kind might be mentioned. Maram grass owes its sand-fixing properties to its power of thriving on deep sandy soils, and of refusing to be buried, no matter to what depth the drifting sand becomes piled above the plant. It roots readily at the nodes, and when a tuft is pulled to pieces each subdivision forms a plant that roots quickly and, spreading rapidly laterally, soon binds the sand by offering a resistance to its movement and causing it to form into heaps or mounds.

Along the outer boundary of seaside plantations nothing equals the maram grass for binding the shifting sands. Not only so, but by using it as a pioneer the amount of shelter afforded renders the cultivation of other less suitable plants possible. It usually attains to a height of from 2 to $2\frac{1}{2}$ feet, much, however,

depending on the exposure of the situation. The root-stock creeps widely, some specimens that have been followed up in the sand extending to 35 yards in length. Amongst loose and drifting sands the running roots find what is suitable for the welfare of the plant, and it is astonishing with what persistency they bind these shifting hills of almost dust-dry sand. In planting this grass the divisions are usually placed in parallel lines about 16 inches apart, the individual tufts being 12 inches from each other. As large tufts can be subdivided to almost any extent, young plants are readily procured. The best way to plant the grass is to stretch a garden line across the sand, take out a notch about 10 inches deep, insert the tufts, replace the sand, and tramp firmly. The lyme grass may be treated in a similar way.

We have also raised a very successful wind-screen along the coast of Wales by planting the sea buckthorn immediately behind the dead fence, following up with the pines already referred to. The buckthorn is by no means particular as to soil, for, plant it anywhere along the coast, and it will succeed, but especially so in drifting sand-hills, whose movement it will soon arrest. In such a position it will grow 10 to 12 feet high, and has the further recommendation that suckers are freely sent up all around the parent plant. In many parts of France seed-sowing takes the place of planting young trees of the cluster pine, the plan, which has been so successfully adopted, being to sow 2 pounds of the seed of the common and Spanish broom, gorse, and maram. After being sown the ground is thatched

with flat branches of spruce, silver fir, or pine, in order to shelter the seedling trees and shrubs. The broom and gorse start away quickly, and afford a great amount of protection to the slower-growing pine, which rarely overtops these till the seventh or eighth year. Although seed-sowing has been found a cheap and excellent method of getting up the cluster pine on the Continent, yet in this country planting young trees, unless in a few instances, has been found preferable. Plants of the broom and gorse are, however, usually raised in position along the sea-coast direct from seed.

With coniferous trees the best size to plant is about 6 inches in height, choosing well-rooted, stocky plants; while hardwoods may be a little taller, or about 12 inches high.

We have found it an excellent plan, when planting by the seaside, to raise the necessary trees in a previously prepared piece of ground adjacent to the coast. Both in Wales and England this method of rearing the young trees was found to be attended with the best results. The cluster and maritime pines, having long tap-roots, require oft and careful transplanting.

Chalky and Calcareous Soils.—Tree planting on the chalk downs and cliffs of the southern coast of England and elsewhere is by no means a difficult operation if systematically gone about. At the outset it is, however, well to remember that many trees which thrive on a chalk formation inland are ill suited for withstanding the exposure to which those on the sea-coast are constantly subjected.

During the past twenty years we have formed many planta-

tions along the coast of Kent, where but a small depth of loam overlies the chalk cliffs, and as some of these have been in every way a success their formation may apply to this class of soil generally, as found in various other parts of the country. Before planting operations are commenced it is indispensable that the soil be thoroughly trenched, and the chalk formation loosened and broken up. In no case, however, must the top spit, which as a rule consists of rich loam, and without which the chalk would be barren, be buried. A fatal mistake is sometimes made, when trenching land preparatory to planting, by burying the top soil and bringing to the surface the poor, underlying subsoil. It should be remembered that a thin rich soil is to be preferred to such as is deep and poor.

This is essentially the case with chalk, as anyone can see on some of the railway cuttings of Bucks, Beds, and Kent, noble beech and other trees thriving where only a few inches of loam overlies the chalk formation.

The best trees to plant on such soil by the seaside are the Austrian and mountain pines, *Cupressus macrocarpa*, *Thuya gigantea*, and the common yew. The Austrian should be planted so as to withstand the first brunt of the sea-breeze, followed up by the Scotch and mountain pine. Amongst hard-wooded trees the elm, evergreen oak, sycamore, and beam tree (*Pyrus Aria*) do best, though several species of willow and poplar are not to be despised. Ten years ago we formed a plantation on the chalk cliffs near Dover, and the Austrian pine, which was planted along the exposed margin of the wood, has

Group at Seaside, including **Mahonia, Olearia,** Lyme Grass, Thorn, Elm, and Poplar.

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attained to a height of from 12 to fully 16 feet, and is bushy in proportion, having been allowed plenty of room for its branch development. The ground was trenched and the solid chalk broken up to a depth of 15 inches, the surface loam being from 3 to 6 inches deep. With the shelter afforded by the Austrian pine other trees have thriven in a remarkable way, and the whole plantation, which is fully exposed, is thriving luxuriantly. Other plantations formed twenty-five years ago on the chalk cliffs by St. Margaret's Bay on the South Coast have also done well, chiefly owing to the shelter provided by the Austrian pine. The shrubs used in connection with these plantations were the sea buckthorn, tamarisk, dogwood, guelder rose, purple-leaved hazel, tree purslane (*Atriplex*), and *Berberis vulgaris.*

The common juniper and savin (*Juniperus communis* and *J. sabina*) have also thriven well, and covered large patches of the adjoining ground.

In connection with tree and shrub planting on chalky soils by the sea-coast, an indispensable condition is to procure thoroughly good plants—stout, well rooted, and healthy—as poor, stunted specimens have but little chance of succeeding under the adverse condition of both soil and climate.

Gravelly Soils.—Where the surface soil is poor, resting on a ferruginous gravel, the difficulties connected with tree and shrub planting are considerable. Thorough trenching of the ground to a depth of 18 inches is to be recommended, the best soil being kept near the surface. Where the situation is very exposed, screen fences of brushwood should be erected as near

to high-water mark as possible. For planting hard, gravelly soils by the sea-coast we have found some of the best trees to be *Pinus maritima*, *P. Laricio*, *P. austriaca*, and *Cupressus macrocarpa*, amongst conifers; while hardwoods include two species of willow (*Salix alba* and *S. caprea*), and the white and grey poplar, alder, birch, and sycamore. Amongst shrubs, the common elder, mountain ash, and white beam tree, German tamarisk, buckthorn, blackthorn, brooms, and furze all do well. On poor soil on a gravelly bottom along part of the Norfolk coast the Austrian pine and goat willow have succeeded best.

Peaty Soils and Mud Flats.—These are difficult to deal with, though fair success has attended the formation of plantations on seaside peat both along the coast of Wales and Ireland. Thorough trenching of such soils is to be recommended, after excessive moisture has been removed by drainage. We have found it advisable to leave the soil roughly exposed in ridges to the weather for a year after trenching, and where at all possible a small quantity of clay or loam should be added to each pit at time of planting.

In Wales, where fully exposed to the sea-blast, and down even to high-water mark, the trees that did best on such soil were the Austrian and Scotch pine, *Cupressus macrocarpa*, *Thuya gigantea*, Lawson's cypress, and the Norway spruce. Hardwooded species included the Huntingdon willow (*Salix, alba*), white and grey poplar (*Populus alba* and *P. canescens*), alder, and birch.

Mud banks are more difficult to deal with than peat, but

Pinus Sylvestris at Hythe.

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that much may be done in the way of raising and solidifying such ground we have ample proof at many points along the southern and eastern parts of England. By far the best covering for exposed mud flats is that afforded by the valuable grass *Spartina Townsendii*, as also its probable parents, *S. alterniflora* and *S. stricta*. Along the Hampshire coast alone nearly 8,000 acres of mud flats are tenanted by this grass, and in France it has extended its area over a coast-line of about twenty-five miles from Capbreton to the estuary of the Bidassoa River.

Though only known in this country since about 1870, *S. Townsendii* has become well established at many points along the East Coast from Lincolnshire to the Thames, and in the south from about Chichester to beyond the Solent. Close to Yarmouth it was found sparsely in 1893, but to-day it occurs in great plenty in that district, and covers the mud banks in the River Yar. In the Southampton Waters, particularly the muddy reaches of the Rivers Test and Itchen, it is abundant. That the presence in quantity of *S. Townsendii* on these mud flats has had a most beneficial and beautifying effect goes for the saying, and already its introduction to other similar positions has been attended with the most happy results.

By planting a few tufts of this grass in bare mud flats without any previous preparation of the soil we have been successful in covering acres of ground with this plant. When the grass has been established for a few years the soil conditions become greatly improved, so much so that several trees, including the alder, willows, and poplars, have started freely into growth.

The sea scirpus (*S. maritimus*), which is common all round the coast of Britain, is likewise useful for planting in salt marshes and along the mud flats, where the creeping root aids it in spreading widely and assisting to reclaim the soil.

Seaside Marshes.—Land that is capable of being reclaimed from the action of tidal waters is to be found along many parts of the coast, such as in river deltas and estuaries, indentations of the shore-line, and adjoining muddy creeks and land streams. Though in the reclaiming of such much has already been done, yet there still remain extensive areas of low-lying land adjoining our coast that might profitably be dealt with in the matter of draining and planting. In such cases the most important point of consideration is whether the initial cost of preparation would be recouped by the value of land reclaimed. In some instances this would not be the case, but the results of experiments that have been carried out on several well-known properties along the coast warrant us in recommending such a course of procedure in certain cases at least. Land that is only flooded at high tide may be most economically and successfully dealt with, as generally in such cases the cost of erecting a protecting fence or mound of soil and carrying out the necessary drainage will not preclude the possibility of future financial returns of a satisfactory kind. At the estuaries of several tidal rivers along the South Coast, particularly on the borders of the Solent and by Poole Harbour, as also along the Welsh coast by the Conway River, and by the River Ribble, near Preston, much land of agricultural value has been reclaimed from low-lying salt

marshes. On the East Coast a large area of marshy, seaside land, the greater part of which was under water at high tide; and only produced some rough grasses of little feeding value, was very successfully dealt with in the way of reclaiming. A mound or embankment of soil, faced next the sea with branches of thorn and willow, was thrown up to a height of 6 feet, the average width being 10 feet at base and 4 feet on top. As the work of building the bank proceeded, so also did thatching with the branches, which assisted greatly in preventing erosion during high tides in stormy weather. Turf from adjoining grassy mounds was largely utilised in building the embankment. Where necessary, drainage was carried out, the soil so removed being spread over the intervening ground, and portions planted with alder, dwarf willows, and the Austrian pine. For three years replacing dead trees was carefully attended to, and on the higher ground, where the trees succeeded best, broom and the sea buckthorn were raised in quantity from seed. Part of the land that was specially treated in the way of soiling now bears good crops of oats and potatoes.

At Hythe, in Kent, large areas of salt marshes have been reclaimed to cultivation since the sea-wall was built. Years ago the site of the games ground and butts for the School of Musketry were irregular stretches of sand and gravel, but with the aid of the embankment, and in some places natural upwash of gravel, which formed a barrier along the sea-front, the whole of this vast tract of ground has gradually become drier and the surface more or less carpeted with seaside vegetation. But

similar instances might be recorded in connection with seaside resorts at various parts of the coast, particularly where large indentations of the land occur.

On the Hutton Estate, near Preston, what is known as the Hutton Outmarsh, close to the River Ribble, was successfully dealt with by forming an embankment about two miles long, by which 300 acres of tidal land were brought under cultivation. The embankment was formed from excavations taken from alongside the line, and is from 8 to 10½ feet high, 3 feet wide at top, and with an outward slope of 3 to 1 and an inward of 2 to 1. Stout turf 3 inches thick cut from the tidal land was used to cover the soil mound, and attention until the soil got consolidated and the turf knit was required for two or three years. Very little of this land required drainage, though a channel 7 feet deep to carry off surplus water was dug at the time of reclaiming the marsh. For the land thus reclaimed there was a keen demand, and at present, what twenty years ago afforded at times but rough cattle pasture, is now first-class agricultural land.

The Romney Marshes, in Kent, which extend to some 24,000 acres, are other examples of what may be done in the way of reclaiming land that is encroached on by the sea. The marsh is an exceedingly fertile, level tract, which is chiefly in use as pasture land for sheep, and defended from the encroachment of the sea by a high, wide embankment called Dymchurch Wall, which extends to a length of fully four miles. The embankment is under the management of a corporation, who carry out all necessary repairs. As well as grazing, parts of the

Pinus Montana for Rocky Maritime Grounds.

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marsh have been successfully planted with several species of profitable timber-producing trees.

Rocky Soils.—Amongst trees that are able to eke out an existence on rocky ledges within the influence of the sea, and where but a small quantity of soil is present, the best will include the mountain pine, birch, alder, beam tree, and mountain ash. Of shrubs, the crowberry, dwarf furze, dwarf juniper, and common savin are to be recommended. The Scotch pine must not be omitted, as on rocky situations self-sown seedlings are often found in a thriving condition, though rarely attaining to a great height.

Clay Soils.—The first preliminaries in the reclamation of stiff clay soils are draining and trenching. Wherever there is a subsoil of stiff clay or poor binding loam thorough trenching to a depth of at least 18 inches is to be recommended. In trenching keep the best soil to the surface, and if time will allow the upturned ground should be left exposed to the weather for at least twelve months before planting is engaged in. Heavy clays are greatly improved by drainage previous to trenching and planting, and removal of surplus water may either be brought about by open drains or ditches, or by using 3-inch drain-pipes. All soil that is not required either in forming open ditches or closed drains should be spread over the adjoining ground that is intended for planting. Amongst trees, both the common and Cornish elm do well in such soils by the seaside. The sycamore is also at home, as is the crack, goat, and Huntingdon willow, the grey and white poplar, alder, and elder. The Austrian pine

is also to be recommended, as is *Thuya gigantea* and *Cupressus macrocarpa*. The shrubs that do best are the euonymus, privet, and golden elder.

Ironstone and Coal Soils.—Where such exist near the coast-line, after preparation of the soil in the way of loosening and improving, the best trees to plant are *Thuya gigantea*, *Pinus montana*, common juniper, sweet chestnut, sycamore, Scotch elm, birch, and Lawson's cypress. Amongst shrubs, the euonymus, berberis of kinds, mock orange, skimmia, tamarisk, and sea buckthorn have done best when planted amongst the refuse of coal and ironstone along several parts of the English coast. The Spanish chestnut is specially recommended for such soils.

Black Moorland Soil.—With reference to soil, one of the most difficult cases with which the writer has had to deal was the planting of a black moorland pan mixed with rough gravel along the coast of North Wales. In this case, as no vegetation of a tree or shrub nature was present as a guide to what might succeed, the soil was dug deeply over, the bottom well loosened, and loam of fair quality from an adjoining farm added to each pit at time of planting. This soiling was engaged in as the site to be planted was an important one, and expense in order to get up the trees was only of secondary importance.

The ground, which was of considerable extent, lies along the coast, and is directly open to the Atlantic, and in no part extended landwards for more than 500 yards. All over the area the soil was of similar quality—a black, ferruginous mixture of earth and pebbles of very poor quality, and ill suited for the

growth of even the most hardy of seaside trees and shrubs. At high tide the sea-frontage was occasionally drenched with spray for 50 yards back from the shore, so that the position was not only difficult to deal with in that way, but on account of the quality of soil as well.

In dealing with the ground a mound of earth about 4 feet high was erected within a dozen yards of the sea, and the inner surface so arranged that a hedge of broom and gorse was quickly got up along the bank by seed-sowing. Behind this barrier the Austrian and Corsican pines were planted in previously prepared pits at a distance of 3 feet apart and 4 feet from line to line.

The plants used were grown on the estate not far from the sea, and were about 18 inches high, stout, well rooted, and healthy. Between the pines the sea buckthorn was planted in clumps of three, the young plants being 6 inches high and stout of build. Six lines of pines were planted next the sea, and inwards the sycamore, winged elm, elder, and alder (common and hoary), Scotch pine, silver fir, white, grey, and goat willow, and black Italian poplar.

After the third year the young pines started away freely, and in company with the undershrubs soon formed quite a thicket. In eleven years some of the Austrians along the sea-margin were 16 feet 8 inches in height, and afforded such an amount of shelter that the other less hardy trees started away quickly, including the sycamore, poplar, and elder, as also the crack willow and alder.

The planting was quite a success; the cost, including digging and loosening the soil, erecting the mound of earth, and trees for planting, worked out at £13 per acre.

The trees that did best in this black pan soil were the Austrian pine, goat willow, white poplar, elder, and sycamore; while amongst shrubs the common and Spanish broom, sea buckthorn, tamarisk, particularly the German, and gorse did well.

Planting Villa and Residential Property.—Planting the grounds of ornamental and residential property by the seaside is frequently greatly assisted by the wall or fence with which such are surrounded. This affords the necessary shelter whereby plants of almost any size can be used with perfect success if the ground has previously been prepared for their reception. The preparation of the ground, which often around residential property is largely composed of building materials and unkindly subsoil that has been taken out in preparing the foundation, is a matter of considerable importance.

Where it is of a stiff, unkindly nature, deep digging or trenching may be necessary, whereas, where the ground has before been under cultivation, opening pits for the reception of the trees and shrubs will suffice.

Mossy or peaty ground should also be trenched, and where possible some of the subsoil, be it sand, gravel, or clay, brought to the surface and mixed with the upper strata. Where coarse herbage, such as bent grass, etc., exists, the best way is to trench the ground and place the top spit in the bottom. But in all

cases the quality and condition of the ground will be a guide as to the preparation that is necessary before planting can be successfully engaged in.

Damp or water-logged ground may require to be thoroughly drained, rocky broken up and relieved of its largest stones, and sandy consolidated by the addition of loam or clay.

After thorough preparation of the soil the hardiest trees that succeed in the district should be planted next to the sea, these in most cases including the Austrian, Corsican, and cluster pines, evergreen oak, and *Cupressus macrocarpa*, following up with the sea buckthorn, tamarisk, broom, and gorse. Leewards of this almost any shrub can be planted, including the bay, laurustinus, barberry of kinds, euonymus, and *Pyrus* of sorts.

Nursery Treatment of Trees for Seaside Planting.—Regarding the nursery treatment of trees and shrubs that are intended for planting along our exposed coast, great care is necessary in order that they may be suited for the position they are to occupy. We have found that trees reared within the influence of the sea have a decided advantage over those from inland nurseries when used for maritime planting. It is, therefore, to be recommended that in the case of extensive planting operations by the sea-coast the trees and shrubs should be reared in nursing-grounds not far removed from the final site of planting. Healthy plants that are stout, stocky, and well rooted should be provided, and this can only be brought about by careful nursery management in the way of clean tillage and

frequent transplanting. Moderate-sized trees are far preferable to taller specimens for exposed seaside planting, and although no specific height for such can be given, yet in most instances the exposure and contour of the ground will afford the best criterion of the size of plants to be used.

There is another decided advantage in having the depot for young trees near where they are to be permanently planted, as the lifting and transplanting can often be carried out on the same or following day—a point of great importance in seaside planting. The situation of the nursery ground should neither be too sheltered nor unduly exposed, and the soil, where possible, of a light quality, so that bushy, fibrous roots will be quickly formed by the young trees. Frequent and careful transplanting is imperative if the most suitable trees for exposed maritime situations are to be produced. Three-year seedlings, twice transplanted, are to be recommended for coniferous trees, but in the case of hardwooded specimens the height and age may be further extended. Of course, much will depend on the situation and exposure of the plantations, and after a wind-barrier has been formed the size of trees and shrubs to be planted may be correspondingly increased.

Time of Planting.—Opinions differ as to the best time to plant young trees and shrubs by the sea-coast. Our own experience, both in England and Ireland, points to the early spring as the best time to insert the plants. Autumn or early winter has this drawback—that the trees are subjected to the blast and salt spray for several months before a start to growth

is made. This not only, in the case of evergreen species, deprives them of half their leaves, but the wind-swaying to which they are subjected strains and injures the roots before they have got established in the soil. In all cases of seaside planting we have found by inserting the young trees and shrubs during late spring the best results are obtained. Along the exposed coast of Wales we have carried out planting operations as late as April with perfect success.

CHAPTER III

TREE GROWTH AROUND THE COAST

SOME of the most successful planting operations by the sea-coast that have taken place in this country are at Holkham in Norfolk, at Southport in Lancashire, in the north-west corner of the county of Moray, and on the Margam Estate in South Wales. In Morayshire large areas of the Culbin sands were successfully planted, while the Holkham sand-hills are an excellent object-lesson of what can be accomplished in the reclaiming of shifting sands by the seaside. Here the sands were held by the maram, after which Austrian, Corsican, cluster, and Scotch pines have thriven well. The Corsican has attained to large size, some specimens being fully 80 feet high and girthing 8 feet in thickness of stem. It grows down almost to high-water mark.

Deciduous trees seem to thrive better on the East than West Coast, probably because the gales are less severe. There is certainly a great difference in tree growth on the east and west coasts respectively of Scotland and England. On the East Coast where lashed by the salt spray, the sweet bay, arbutus,

evergreen oak, tamarisk, laurustinus, and clematis may be found in a thriving condition. Along the West Coast, from the Solway Firth southwards, deciduous trees cannot be said to do well, the foliage at an early period of growth getting blackened and sadly injured by the blast. The willow, however, thrives amazingly, and in some parts of Lancashire it is freely planted, as also the poplar and laburnum. On the exposed coast of Yorkshire *Cupressus macrocarpa*, elm, sycamore, Turkey oak, laburnum, and white beam succeed best. Along the Northumbrian coast the Ontario poplar, golden elder, sycamore, Huntingdon willow, oval-leaved privet, and common elder succeed well where the ground stretches far into the North Sea. On the most easterly part of Suffolk the gorse and tamarisk are locally planted, as they succeed down even to high-water mark. At Eastbourne some splendid elms are growing within a few yards of the sea. The cornish elm and sycamore also are favourites here. Around Dawlish and Powderham Castle, Devonshire, there are some fine examples of the evergreen oak, which luxuriate down to the shore. Devonshire coast is favoured in the matter of climate, for there *Fabiana imbricata*, myrtles, escallonias, and many other half-hardy shrubs thrive to perfection. For planting along the southern coast there is a wide range of material, including the myrtle, verbena, and pittosporums. In Devon and Cornwall, two of our most sea-exposed counties, ploughing to a depth of 9 inches and planting *Pinus Pinaster* at 6 inches apart is recommended, and has been attended with excellent results. Failing ploughing, pits 16

Evergreen Oak for Planting by the Sea Coast.

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inches in diameter should be made at 3 feet apart, and if possible a year before the trees are planted.

At Land's End and around Penzance one can form a good idea of the trees and shrubs that can succeed along this wild and rugged shore that is quite open to the breezes which blow in from the English Channel. Here *Pinus insignis*, *P. maritima*, *P. austriaca*, and *P. Laricio* all do well a short way inland; while of hardwooded species the goat willow, elms of several kinds, ash, beech, and sycamore, with poplars included, are evidently the best trees. Of shrubs, those that we noted doing best were pittosporums, escallonias, euonymus, Muehlenbeckia, common gorse, and whitethorn. The euonymus is planted everywhere at Penzance, and thrives amazingly.

Near the Lizard, where the ground is very exposed, the gorse, though comparatively dwarf, extends farther seaward than any other shrub. Having explored all the Channel Islands, Scilly Isles, Isle of Wight, and along to Land's End, it is interesting to note which trees and shrubs succeed while others similarly circumstanced are burnt and scorched. Prominent amongst those that are able to withstand the first brunt of the sea-breeze are *Euonymus europæus*, *E. latifolius*, Virginian creeper, ivy, *Spartium junceum*, myrtles, and arbutus. Phillyreas likewise do well, as also the tea tree (*Lycium*), and at least two species of escallonia.

It is surprising the amount of storms and sea-washings that the myrtle will stand; while *Escallonia macrantha* is one of the best of southern shore shrubs. The rosemary (*Rosmarinus*

officinalis) will grow to a large size where lashed by the salt spray. *Escallonia latifolia* and *E. rubra* are first-class seaside shrubs, and at Penzance are used as hedges, some of those near the sea being 6 feet high and nearly 3 feet in width. *Arbutus Unedo*, the strawberry-tree, is always bright and green at every time of the year, and can stand drenchings of salt spray in a remarkable manner. *Phillyrea media, P. angustifolia, P. rosmarinifolia,* and *P. ligustrifolia* all stand the sea-wind without a scorched shoot or leaf.

The tea tree (*Lycium*) at some places along the coast, and even on banks of saline sand, where it is swamped at very high tide, grows freely and produces suckers in abundance. It is an excellent shrub for fixing blowing sands.

Along the coast of Kent, where the soil is largely composed of chalk, the Austrian pine is first favourite, then the mountain and Corsican pine and *Cupressus macrocarpa.* Hardwoods include the sycamore, elm, poplar, and willow; while of shrubs the sea buckthorn and tamarisk certainly succeed best. At Walmer Castle there are some fine clumps of the evergreen oak, while the adjoining plantations are mainly of sycamore, elm, beech, and Scotch fir thickly planted. The arbutus, holly, and *Cupressus funebris* also thrive well. "Why not plant, and plant as Pitt did very successfully at Walmer Castle, two for one?" is an advice that is often given in connection with tree planting by the sea along the Kentish chalk cliffs. At Birchington-on-Sea, with only the protection afforded by a stone wall, some very good ash timber has been grown.

Cupressus Funebris at Walmer Castle.

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On the Isle of Man several trees do well, but *Thuya gigantea* and the Ontario poplar are perhaps the best. At Bodorgan, in Anglesea, *Pinus insignis* grows well, and is in perfect health a few yards from the sea. First comes the sea buckthorn, gorse, broom, tamarisk, and *Berberis Darwinii*, after which *Pinus insignis* and the evergreen oak form a capital shelter for many kinds of trees and shrubs.

Near the North Foreland Lighthouse, on high, exposed ground, the German tamarisk thrives well, and has attained to large dimensions, some of the stems exceeding a foot in diameter. At Bournemouth the salubrious quality of the air is largely due to tree planting, particularly the Scotch, Weymouth, and cluster pine.

On the Carnarvonshire coast, where fully exposed to the Atlantic, we have formed several plantations for ornament and use. The soil was mainly composed of sand intermixed with peaty earth, and in some places mud flats had to be contended with. Here a screen of brushwood was erected, behind which were planted the Austrian, Corsican, and cluster pines, with broom, gorse, and sea buckthorn, all of which have done well. Seed-sowing was resorted to in the case of broom, gorse, and cluster pine. Near the mouth of the River Aber, in Carnarvonshire, a small area of sandy seaside ground was very successfully dealt with by the writer. Ornament was the main idea, and by erecting a screen fence of branches from an adjoining plantation and sowing seeds of the cluster and Austrian pine, the sea buckthorn, broom, white and yellow flowering, and other well-tried shrubs, a most effective plantation has been the result,

But all along the coast-line from Bangor to Aber many thriving plantations on Lord Penrhyn's estate are to be seen. Some of those nearest the sea are almost at high-water line, and though stunted in growth, afford excellent shelter to other plantations farther inland. Those nearest the sea are composed of ash, willow, poplar, sycamore, Norway maple, and the Austrian pine; while farther back larch, Corsican pine, and mixed hardwoods constitute the main crop. Most of these plantations were formed seventy years ago, and when forty years planted some of the larch from the inland woods were sold at 18s. each. Previous to planting, this seaside district was described as "a dreary, wind-swept tract of comparatively unprofitable land, where only a few clumps of stunted coppice oak relieve the dull monotony of the coast-line." To-day, however, it is widely different, and with the kindly shelter afforded by the plantations both agriculture and grazing land has been greatly improved.

On the most exposed part of the Isle of Anglesea, where the Atlantic blasts blow loud and long, the evergreen oak is a favourite tree, though *Cupressus macrocarpa*, *Pinus austriaca*, and *P. insignis* also do well. Near the mouth of the Thames, at Sheerness and Shoeburyness, hardwooded trees, especially the ash and sycamore, thrive.

In Wigtonshire and the Island of Bute the cluster pine attains to a height of 70 feet, though the winds at times blow with terrific fury. Valuable timber is produced on Bute.

On the Ayrshire coast and the Island of Arran and shores

Corsican Pine and Buckthorn in Seaside Plantation.

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of Campbeltown both *Pinus montana* and *P. Pinaster* are first favourites, and the same trees do well along the coast of Galloway.

Along the Firth of Forth several trees do well, but probably the Austrian pine is best of all. In Wigtonshire and Ayrshire the Corsican pine and Monterey cypress thrive down to sea-level, also the Pinaster does well; while along the Firth of Clyde the silver fir and Austrian pine appear to luxuriate and to attain to a large size.

Successful planting by the sea-coast has also been carried out at Lewis in the Isle of Skye, at Morinish in Mull, as well as in the Shetland and Orkney Islands. The sycamore does best in Shetland, followed by the mountain and common ash, laburnum, elder, mountain pine, maple, spruce, and birch. Near Lerwick and at Balta Sound the trees are doing well. In the Hebrides are found many remains of the goat willow, and though of stunted growth other species also do well.

Tree planting on the various islands, but particularly along the northern and western coast of Scotland, has been attended with a fair amount of success, though many of these places still wear a dreary and treeless aspect. The fierce and long-continued gales that sweep across these islands, heavily laden with saline moisture from the Atlantic, have a most injurious effect on the newly planted trees and shrubs. In such cases the first and most important point to be observed in tree planting along these wind-swept coasts is to select the most suitable positions on which to form the initiatory groups or belts.

In Ireland tree growing is generally successful wherever partial shelter is afforded, and along the coast of Co. Down the Aleppo pine (*Pinus halepensis*), raised from seed, has succeeded well in company with *P. insignis*, *P. Laricio*, *P. Laricio austriaca*, and *Cupressus macrocarpa*. At Penrhyn Castle, in Wales, the Aleppo pine has also done well. Near the mouth of Belfast Lough, in the North of Ireland, out of a large number of trees that were included in some plantations the Austrian pine, sycamore, willow, and poplar have done best.

Along the west coast of Ireland the favourite trees are the poplar, willow, alder, and elder. In Co. Clare, with a free outlook to the Atlantic, and fully exposed at 400 feet altitude, the following shrubs have been noted as doing well: *Fuchsia Riccartonii*, *F. globosa*, *Buddleia globosa*, *Leycesteria formosa*, *Viburnum opulus*, *Ribes*, *Veronica* (various), *Escallonia macrantha*, *Hydrangea hortensis*, Hypericum of sorts, and *Salix alba*. The Dutch alder and poplars also thrive well.

Though success in tree and shrub planting by the sea-coast has usually followed in the wake of thorough preparation of the ground, trenching where necessary, and using the right kind of plants, yet instances are recorded where utter failure, as in the Knockboy plantations in Ireland, has been experienced. The Knockboy plantations, in Connemara, extending to 960 acres, were planted by the Irish Government in 1890, under the plea that if the trees grew in this situation, where exposed to the full fury of the Atlantic gales, it would be an object-lesson that much of the waste land in Ireland could

be turned to profitable account. The cost of this planting scheme was fully £10,000, but it has turned out a failure, largely owing to the rocky ground and exposed site. When last we examined this plantation the only trees that could be said to be thriving were the Austrian and mountain pines, some of which in sheltered glades had attained to fair size, and were green and healthy.

Other failures of a minor character could be recorded, but in all cases the necessary preparation of the ground had not received due attention, and to this may mainly be attributed the want of success in the formation of plantations on exposed ground by the seaside.

Thorough preparation of the soil in the matter of drainage, trenching, and the erection of a wind-screen on the most exposed sites is to be recommended. Where the ground to be planted faces the open seaboard and is comparatively flat, planting trees without providing a suitable wind-screen is rarely attended with good results; whereas, by the erection of a dead fence of gorse, spruce, or other branches, great advantages will accrue, and the young trees be afforded a favourable start to growth. As before stated, these wind-screens are of the simplest construction, and cost only a few pence per yard for material and erection. Posts about 7 feet long are driven into the ground at 12 feet apart. Two wires or rails of wood are stretched along the posts, and the whole thatched with brushwood. Behind this dead fence the best shrubs to plant are the common elder and the sea buckthorn at a distance of 3 feet apart, in order to form a belt 18 to 20 yards

deep. The selection of the most suitable trees for planting on exposed sites will next require attention, and in all cases indigenous species should have preference. For particular situations and soils certain species of trees are better adapted than others, and on the exposed islands of Scotland this is a matter that should receive attention, preference, as before stated, being given to native kinds. The sycamore is an excellent tree for planting on the most exposed parts of the coast. On almost any soil and situation this hardy tree will thrive well, and on some of the most wind-swept islands along the northern coast it is the favourite tree.

The common alder and *Populus tremula* thrive where fully exposed to the sea-blast, and equally good, according to soil, are the goat and white or Huntingdon willow (*Salix caprea* and *S. alba*), the Norway maple, *Pyrus* of sorts, but especially *P. Aucuparia*, the hoary alder (*Alnus incana*), elm, birch, and ash. Inwards the evergreen oak does well, whilst of shrubs we particularly noticed the healthy appearance of the bird cherry, holly, whitethorn, snowberry, lilac, flowering currant, some of the meadowsweets, especially *Spiræa adiantifolia*, laurustinus, and *Berberis Darwinii*.

The islands along the south coast are not so difficult to deal with in the matter of trees and shrubs, and on the Isle of Man many species succeed that could not eke out an existence on the Scottish coast.

On the extreme south coast of England tree and shrub planting on the adjoining islands is attended with a considerable

Berberis Darwinii Flourishing by the Seaside.

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amount of success at a minimum of expense in the matter of protection. Many half-hardy trees and shrubs may be found in these islands, which differ greatly in quality of soil, exposure, and latitude to those along the coast of Scotland.

In preparing and planting seaside grounds the following rules should be observed:

1. On drifting sands and quickly sloping grounds shelter in the way of screen fences must be provided. The best wind-screen is a two-bar wooden fence thatched with gorse or spruce branches.

2. Preparation of the soil, where this is composed of peat, clay, or gravel, is imperative. Trench 18 inches deep, keeping the best soil near the surface.

3. Wet, low-lying flats by the seaside should be drained and ridged a year at least before being planted.

4. Tree-planting should, in the case of exposed ground, be carried out in March or April, and where good shelter is provided in October and November. Mossy or peaty ground should, however, never be planted till spring.

5. The young trees should be healthy, stocky, well rooted, and if possible reared in the neighbourhood where they are to be planted. Seed-sowing is preferable to using young plants in the case of *Pinus Pinaster*, gorse, broom, and several of the sand-binding grasses.

6. In planting by the seaside it is most essential to expose the roots of the trees for as short a time as possible to the brine-charged air and drying winds.

7. Plant close and thin early, so that bushy growth may be induced. Firm planting with the strongest roots to the prevailing winds must be attended to.

8. The hardwooded trees may be periodically pruned in order to induce a thick, compact growth, and so that the side branches may not lash their neighbours and get broken by the wind.

9. Keep the trees from overcrowding, so that a free current of air can pass between them, remembering that crowded trees are poorly rooted and readily blown over in stormy weather.

10. An annual examination of newly formed plantations is imperative in order that such as are wind-swayed may be placed in the upright position.

11. Mud flats require special treatment, and are dealt with in Chapter II.

The following trees and shrubs, alphabetically arranged, are recommended for seaside planting:

Trees for the Sea-Coast.

Acer campestre.
„ creticum.
„ pseudo-platanus.
Alnus glutinosa.
„ incana.
Betula alba.
Carpinus betulus.
Cedrus atlantica.
Cupressus macrocarpa.
Fagus sylvatica.
Pinus Banksiana.
Pinus helepensis.
„ Laricio.
„ austriaca.
„ montana.
„ Pinaster.
„ „ maritima.
Populus alba.
„ canadensis.
„ canescens.
„ nigra.
Pyrus Aria.

Pyrus Aucuparia.
Quercus Cerris.
„ Ilex.
„ Robur.
Salix alba.
„ caprea.
„ Forsteriana.
Salix Russelliana.
Thuya gigantea.
Ulmus alata.
„ campestris.
„ cornubiensis.
„ montana.

Shrubs for the Sea-Coast.

Aloysia citriodora.
Ampelopsis Veitchii.
„ Virginiana.
Arbutus Unedo.
Atriplex halimus.
Aucuba Japonica.
Baccharis halimifolia.
Berberis of sorts.
Buddleia globosa.
Cerasus lusitanica.
„ Padus.
Cistus, various.
Cotoneaster, various.
Corylus Avellana.
Cytisus Laburnum.
„ scoparius.
Daphne Laureola.
„ Mezereum.
Deutzia crenata.
Escallonias, various.
Euonymus japonica.
„ europæus.
Fabiana imbricata.
Forsythia of sorts.
Fuchsia Riccartonii.
Garrya elliptica.
Griselinia litoralis.
Halimodendron argenteum.
Hippophaë rhamnoides.
Hypericum, various.
Ilex aquifolium.
„ „ aurea.
Laurus nobilis.
Lavatera arborea.
Leycesteria formosa.
Lonicera nitida.
Lycium europæum.
Mahonia aquifolia.
Muehlenbeckia complexa.
Myrtus, several.
Olearia Haastii.
„ macrodonta.
Osmanthus ilicifolia.
Philadelphus, various.
Phillyrea of sorts.
Pittosporum Tobira.
„ undulatum.
Rhamnus frangula.
Ribes sanguineum.
Rosa spinosissima.
Ruscus aculeatus.
Salix alba.
„ caprea.
„ repens.
„ Russelliana.
Shepherdia argentea.
Spartium junceum.
Spiræa adiantifolia.

Spiræa ariæfolia.
Syringa persica.
„ vulgaris.
Symphoricarpus racemosus.
Tamarix gallica.
„ germanica.
„ tetrandra.
Thorn, common.
Thorn, Paul's crimson.
Ulex europæus.
Veronica, various.
Viburnum Opulus.
„ Lantana.
Weigela rosea.
Yucca filamentosa.
„ gloriosa.

Grasses.

Elymus arenarius.
Psamma arenaria.
Scirpus maritimus.
Spartina Townsendii.
„ alterniflora.
„ stricta.

CHAPTER IV

TREES FOR SEASIDE PLANTING

IN preparing lists of the most suitable trees and shrubs for planting in maritime situations several considerations have to be borne in mind. The quality of the soil is a most important factor, so is exposure, and whether the eastern or western side of our islands has to be dealt with. With the exception, however, of pure shifting sands and mud flats other soils can readily be prepared in the matter of trenching and otherwise improving their condition, so that the majority of hardy trees found able to withstand the saline blast from the sea can be successfully planted along most parts of the coast. It is a curious fact that shrubs with grey or silvery foliage are best able to withstand the first brunt of the sea-breeze. As examples we may point out the sea buckthorn, salt tree, *Atriplex*, tree purslane, *Griselinia*, box thorn, *Shepherdia*, maram, and lyme grass, all of which have light grey or silvery foliage, as if coated with a saline deposit.

It is unfortunate that some of the best trees for seaside planting are what is termed "tap-rooted," and consequently

difficult to transplant, including the evergreen oak, *Pinus Pinaster*, *P. Laricio*, and *P. Laricio austriaca*. Seedlings of the evergreen oak are either sown in pots or shifted into these when a year old, and during the third or fourth year can be transplanted with safety to their permanent positions. *P. Pinaster* is difficult to transplant, and, like the evergreen oak, if lifted from the nursery ground in the usual way success is uncertain.

P. Laricio and *P. Laricio austriaca* should be transplanted every second year until planted out permanently.

The following list of trees, shrubs, and other plants that have been found suitable for seaside planting are as far as possible arranged according to their value for so doing. The majority is suited for coming in contact with the ozone-laden winds by the seaside. Inwards from these well-tried kinds almost any tree or shrub may be planted.

The Cluster or Maritime Pine (*P. Pinaster*).—For shelter-giving purposes or planting in pure sand by the sea-coast this is probably our most valuable tree. Certainly in a survey of the coast of the British Isles this pine was found to be more commonly planted than any other, except perhaps the Austrian, and in positions, too, where few other trees could succeed. It is a tree of giant proportions, with a ponderous trunk covered with rough, flaky bark, and usually has a well-rounded head of intense green foliage. The leaves are stout and stiff, 8 inches long, and produced in twos, while the clustered cones, from eight to twenty in a group, give the popular name to the tree. For

Pinus Pinaster for Reclaiming Sand-Dunes.

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planting along the most exposed part of the coast of Scotland and the isles the palm of honour must be awarded to the *P. Pinaster*.

But not only in Scotland has the *Pinaster* been found the most valuable tree for exposed seaside planting, for in many parts of England, as the coast of Norfolk and other sandy wastes, it has no equal for shelter-giving purposes. On the Continent, particularly in France and Belgium, *P. Pinaster* has a wide reputation for the reclaiming of shifting sand-dunes by the coast.

This pine has a strong tap-root, which in loose sandy soils descends perpendicularly to a great depth and places the tree beyond the effects of drought. This peculiarity makes it difficult to transplant with safety unless its nursery management in the way of frequent removing has been regularly attended to. Seed-sowing in the case of *P. Pinaster* is usually resorted to on the Continent, and in this country the practice has also met with success, especially along the southern coast.

For constructive purposes the timber is of no great value, but the by-products of the tree in the way of firewood, resin, tar, and turpentine are considerable. The so-called variety, *P. maritima*, is usually of more bushy habit than the species, and an excellent shore tree.

Austrian Pine (*P. Laricio austriaca*).—Taking the British Isles as a whole, probably next to *P. Pinaster* for withstanding the sea-blast comes the Austrian. It does not equal that

tree for planting in sand, but as an all-round, shelter-giving evergreen it has certainly no equal. The Austrian occurs in larger numbers along our coast-line than perhaps any other evergreen tree, and although growing freely on light sand or gravel, will succeed on heavier soils and chalk than either the *P. Pinaster* or *P. Laricio.* For producing shelter it is unsurpassed, and when given plenty of room for development of the side branches forms a wide-spreading and picturesque tree. Like *P. Pinaster*, it is difficult to transplant, and in order to prepare it for its final position by the seaside oft and careful transplanting in the nursery border is recommended. The timber is of no special value, though strong, tough, and resinous. We have planted the Austrian in large numbers on the chalk cliffs near Dover, where it succeeds admirably and forms a shelter that amongst trees is unsurpassable. At Penrhyn Castle, in Wales, it is one of the most valuable shelter-producing pines for seaside planting, and is rarely uprooted by the storm.

Corsican Pine (*P. Laricio*).—Though not equalling either of the former trees for withstanding the first brunt of the sea-blast, yet the Corsican is a valuable species for maritime situations. It is of more erect growth than the Austrian, with shorter branches and a cleaner and more valuable trunk. At many parts of the coast of Scotland and England this pine thrives well, and in some instances down even to high-water mark.

The Corsican is difficult to transplant, and therefore requires careful nursery management; and when planted out permanently succeeds best in a gravelly loam. The timber is of considerable

Pinus Austriaca for Shelter at the Seaside.

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value, and the tree is recommended for general afforesting purposes.

Mountain Pine (*P. montana*).—Though of low growth, this is a capital tree for withstanding the worst winds of the sea-coast. We have used it with marked success on the high, chalky cliffs of Southern England, also on the Welsh coast, and in every case where fully exposed to the saline blasts it has proved itself a valuable seaside pine. On rocky, almost soilless ground, where few other evergreens could succeed, the mountain pine thrives amazingly, and spreads about to a comparatively wide extent. In sandy and gravelly soils it also does well, where it is useful for covering bare spaces in exposed situations.

Other pines that do well in certain situations along the coast are *P. insignis*, which in several parts of England and in the Isle of Anglesea has attained to large size, but it is not to be recommended for general planting. In Cornwall this pine has been largely planted, and is a much-prized and valuable tree. It, however, suffered greatly during the severe winter of 1916-17 and was killed out in several places.

The Scotch pine (*P. sylvestris*) is sometimes planted, but it cannot stand the first brunt of the storm, though of great value inwards and where partial shelter is afforded. The Aleppo pine (*P. halepensis*) in a few situations, such as at Penrhyn Castle and other places in Wales, and Co. Down, Ireland, has attained to a large size, but for general use along our coast it is not to be depended upon.

Banks' Pine (*P. Banksiana*) thrives on the poorest classes of

soils, such as dunes and shifting sand. In Ireland particularly it has been turned to good account in the planting of bare peaty soils by the sea-coast. It is of low, straggling habit, rarely exceeding 20 feet in height, and much in the way of the better-known *P. montana.*

The Stone or Umbrella Pine (*P. Pinea*), from the Mediterranean coast, also succeeds both in England and Ireland, where large specimens are to be found by the seaside.

Thuya gigantea has been tried successfully for seaside planting, but only where a certain amount of shelter is afforded. It grows rapidly, but should not be planted in pure sand. A valuable tree both for shelter and afforesting purposes.

Evergreen Oak (*Quercus Ilex*).—Around the coast of England and Ireland the Holm, or evergreen oak, is a most valuable tree, as it will succeed and continue to thrive when planted in light, poor soils and where lashed by the salt spray. On the exposed coast of Anglesea, where the full force of the Atlantic is experienced, there are some noble evergreen oaks, as also at Walmer Castle in Kent and many other parts of the coast. In Scotland it is less frequently planted. The evergreen oak requires careful nursery management, as it is one of the most difficult trees to transplant with which we are acquainted. Pot culture is usually resorted to, but for various reasons the open border and frequent transplanting is to be recommended. For shelter-giving purposes the evergreen oak has few equals, and luxuriates at high-water mark by the seaside.

Monterey Cypress (*Cupressus macrocarpa*).—This is a true

Stone Pine at the Seaside.

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seaside conifer that may be found all along our coast, and thriving well down even to where it is lashed by the salt spray. As a seaside tree this cypress is unrivalled, while, as it bears clipping and pruning with impunity, is often used as a screen or hedge plant. Its greenness of foliage, coupled with the warm chocolate-coloured bark and rapidity of growth, have made this tree a general favourite for seaside planting in almost every part of the country. Inland it is not so dependable, especially in high-lying and exposed districts. From its rapidity of growth and dense, heavy foliage young trees are apt to get damaged by the wind, but in order to counteract this staking should be early resorted to, particularly in exposed situations. The Monterey cypress is readily raised from seed, and requires no special treatment whilst in the nursery border. As an ornamental tree of rapid growth, suitable for seaside planting, this cypress can be confidently recommended.

Deciduous Trees.—Though we have given preference to some of the coniferous trees for planting within the influence of the sea-breeze, yet several of the broad-leaved or hardwooded species are valuable for a similar purpose, and may be seen in a thriving condition along the western coast of Scotland, where they are exposed to the most terrific storms.

Sycamore (*Acer Pseudo-platanus*).—Conspicuous amongst hardwoods for doing battle with prolonged storms on the exposed sea-coast, and where the roots are sometimes in contact with salt water, must be placed the sycamore. Everywhere along the coast it thrives well, and is rarely so affected by the wind as to

become one-sided even when standing alone and in the most exposed situations. It succeeds well down to high-water mark, the stout, twiggy branches being thrown out into the very teeth of the blast. Even during winter, and when in a leafless state, the amount of shelter afforded by the sycamore is considerable, and for this reason it has been extensively planted on residential property within the influence of the sea. Then, as a valuable timber producer it is one of the best, whilst it is readily raised from seed, grows quickly, and is little subject to disease or to be uprooted during stormy weather. Taking everything into consideration — hardihood, suitability to various soils and situations, and value of timber produced—we consider the sycamore the most valuable of any hardwood for seaside planting.

Norway Maple (*Acer platanoides*).—For seaside planting this is a valuable tree, and one that has been extensively used in the formation of plantations and screen belts at many parts of the coast. Planted inwards from the coniferous trees already recommended the Norway maple has given good results all along the western shores, and we have used it largely both on the seaside of Wales and in the North of Ireland. It is a hardy, fast-growing tree, and for ornamental planting is particularly valuable.

Willows of several kinds, but particularly the Huntingdon (*Salix alba*), Bedford (*S. Russelliana*), goat (*S. caprea*), and crack (*S. fragilis*), are all more or less valuable as seaside trees. On the Lancashire coast, about Blackpool and Southport, the willow

White or Huntingdon Willow.

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is extensively used in the formation of screen belts to protect gardens from the severe blasts to which this part of the coast is almost constantly exposed. Close to the sea at Clifton Hall the willow has done good service in the rearing of young plantations, and some of these trees that were used as screen fences are now of considerable size, and little the worse for the breeze to which they are constantly subjected. Where fully exposed to the saline blast from the Irish Sea we have used the Huntingdon willow with marked results; but, indeed, at almost every part of the shores of the British Isles the willows stand nobly out, and have acted as pioneers in the rearing of young belts and plantations along the exposed parts of the coast.

White Poplar (*Populus alba*).—This tree comes second to no other of the hardwooded species for planting in sandy wastes by the seaside. At Knocke, in Belgium, it actually revels in the deep sand that has been blown in from the sea, and there spreads to a wide extent by means of root offshoots, which in the light soil are abundantly produced. As an ornamental tree, especially when stirred by the wind and the undersides of the leaves revealed to view, the white poplar is much appreciated.

When planted by the seaside in order to assist in fixing the blowing sands the white poplar is usually kept cut down to about 6 feet in height, when it quickly forms an almost impenetrable jungle of shoots and leaves of abnormal size, thus affording a great amount of shelter to other less hardy kinds. The white poplar is readily increased and transplanted, and one of the hardiest and best storm-resisting trees in cultivation, and as it

succeeds well in almost pure sand is of considerable value for seaside planting.

Grey Poplar (*P. canescens*).—This tree is of noble growth and well suited for planting within the influence of the sea. Along the exposed coast of Wales it is largely in use for shelter-giving purposes, while it produces a valuable timber that is much in request for various important purposes.

Black Poplar (*P. nigra*) and the Aspen (*P. tremula*) have both been turned to good account for imparting shelter along the coast in almost every part of our islands. They are of rapid growth, thus affording a quick shelter, the only drawback being that, owing to the brittle nature of the wood, large branches are apt to get broken off in stormy weather. For avenue planting by the exposed seaside in Belgium and Holland both of these species are largely in use.

The Ontario Poplar (*P. candicans*) is one of the best species for planting in exposed seaside situations. For raising shelter until other trees can be got established it is certainly the best of its tribe. At many parts of our exposed coast and on the adjoining islands it has been found of the greatest value for shelter, and is able to succeed at high-water mark and in soils of by no means the best description. The growth is rapid.

Elms, particularly the Scotch (*Ulmus montana*), the Cornish (*U. cornubiensis*), and the Winged (*U. alata*), are all to be recommended for planting on exposed ground by the seaside. At many points of the coast of Scotland and Northern England the common and weeping elm succeed admirably, and though rarely

Weeping Elm for Ornamental Seaside Grounds.

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attaining to a large size, is yet of considerable value as a shelter-giving tree on bleak and exposed ground by the seaside. It will also thrive in almost any soil that is not water-logged, is readily propagated, transplants freely, and affords a great amount of shelter to other less hardy trees. At Eastbourne and other seaside towns the common elm grows splendidly, and is of large size within a hundred yards of high-water mark, while the Cornish elm for street planting in maritime situations has few equals. In the Orkney and Shetland Islands, and all along the coast-line southwards, the elm ranks next in value to the sycamore amongst hardwooded trees for seaside planting.

Turkey Oak (*Quercus Cerris*).—This is a valuable tree for planting by the seaside where a small amount of shelter is provided. In partially sheltered situations along the South Coast it thrives within a few yards of the sea, and, being thickly foliaged, gives a great amount of shelter to other less hardy species of trees and shrubs. As an ornamental tree the beautifully divided leaves and mossy cupped fruit attract attention. In exposed places along the coast of Scotland and Wales we have seen some noble trees of the Turkey oak, especially where such had not to contend with the direct breeze from the ocean.

Alder (*Alnus glutinosa*).—For planting in wet and marshy places along the seashore the alder is especially adapted. It withstands seaside exposure well, and along with the hoary-leaved species (*A. incana*), which, however, grows well on dry, warm soils, is especially valuable for maritime planting. Along

the coast of Wales the alder may be seen growing within a few yards of the sea, and where often affected by the salt spray; but though dwarfed in growth, and of little value from a timber point of view, it is of considerable importance where exposed, marshy lands have to be dealt with. In the Northern Scottish islands the alder is one of the most valuable trees. We have found it a good plan by the seaside to plant the alder thickly on the ground, and when, say, 10 or 12 feet high, to cut one-half of the trees over. By so doing a number of stout shoots are thrown out, and when these have attained to a height of 6 feet the standards that were originally left may be cut over in a similar manner. When all have produced shoots a valuable shelter is obtained.

The Bird Cherry (*Cerasus Padus*) must on no account be omitted from a list of small-growing trees that are suitable for planting in seaside woodlands.

The bird cherry, or hag berry, is an indigenous tree with oblong, doubly serrated leaves, and terminal or axillary racemes of pure white flowers. It is able to stand exposure well, and for that reason, as also being highly ornamental, should find a place in plantations by the sea-coast.

The Mahaleb, or Perfumed Cherry (*C. Mahaleb*), is another excellent seaside subject, where it grows stout and flowers freely. Though of small size, yet this cherry produces quite a pleasing effect when planted near the front of the shrubbery in the seaside garden.

The Thorn (*Cratægus oxyacantha*) and several well-marked

Strawberry Tree for the Seaside Garden.

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varieties, particularly Paul's crimson, are good trees of small growth for planting by the seaside. They cannot succeed in sand, but in loamy gravel or chalk they are quite at home. Paul's crimson is one of the best, and flowers all the more freely when subjected to the ozone-laden moisture of a partially sheltered seaside garden.

The Arbutus, or Strawberry Tree (*Arbutus Unedo*), is a striking tree of low growth that succeeds well in maritime situations, but it should not be planted where exposed to the first brunt of the seaside gale. Several other species of the arbutus, notably *A. Croomei*, succeed well along the southern coast of England.

Elder (*Sambucus nigra*).—Amongst trees of small growth, the common elder is one of the most valuable for planting in exposed seaside districts. Its powers of endurance are even greater than those of the sycamore, though the amount of shelter it affords is not so great. Where its branches are constantly exposed to the saline-laden blast, and its roots amongst sand and shingle, it grows and thrives in a manner that is quite remarkable. On the dreary, sandy wastes by the Lancashire coast, where the shore is sometimes covered with wrecks, the elder stands nobly out, and some giant specimens are conspicuous for a long distance in every direction growing quite alone and in poor, sandy soil. But everywhere along the coast, even on the Orkney and Shetland Islands, the elder is quite at home, and as it succeeds well beneath the drip of large growing trees is valuable for under-planting by the seaside.

White Beam Tree (*Pyrus Aria*) and the Rowan, or Mountain Ash (*P. Aucuparia*), are excellent seaside trees of small growth. On the exposed limestone cliffs of the Great Orme's Head, and close to the sea, the beam tree grows well, and that even in cold, exposed, almost soilless sites, where few other trees could eke out an existence. The hard, leathery leaves seem as if specially constructed to withstand long-continued storms.

All along the coast of Great Britain the mountain ash may be found growing luxuriantly and affording a great amount of shelter. It may be planted without fear of harm down even to high-water mark and amongst soil of the poorest description. As an ornamental tree, both in foliage and fruit, it requires no recommendation.

The Chinese Juniper (*Juniperus chinensis*).—This is a favourite coniferous tree of small growth for planting in sea-coast gardens, where it succeeds much better than when used in inland situations. It is a handsome bush of weeping habit with glaucous blue foliage, and when planted in peaty earth or sandy loam soon forms a shrub of surpassing beauty. Nurserymen who cater for seaside planting find this juniper of particular value, and raise it in large quantities.

Nordman's Fir (*Abies Nordmanniana*).—This tree has been found well suited for planting in seaside situations, where, especially when sheltered from the direct blast, it grows rapidly and soon forms a neat, symmetrical specimen. It is perfectly hardy, and affords a great amount of shelter to other trees and shrubs.

White Beam Tree at the Seaside.

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In gardens along the southern and western coast of England, and also in Ireland, Nordman's fir is largely cultivated—in fact, it has proved itself the best of the family for seaside situations.

The Tulip Tree (*Liriodendron tulipifera*) has succeeded admirably within a few yards of the sea along several parts of the Kentish coast. At Walmer Castle it is 60 feet high, with a trunk that measures 6 feet 10 inches at a yard from the ground. It should not be planted in situations where directly exposed to the first brunt of the storm.

English Maple (*Acer campestre*).—This native, small-growing tree can well hold its own, whether planted as a standard specimen or used as a screen hedge by the seaside. In chalk or limestone it thrives best, and on the exposed cliffs of Southern England is one of the most useful of hedge plants. Being readily propagated, perfectly hardy, and growing thick and bushy, it is a most valuable dwarf tree for planting anywhere along our coast.

Birch (*Betula alba*).—For seaside planting on the barest of ground—rocky or gravelly—the birch is one of the most useful trees. On the Island of Scurba and others along the Scottish coast that are fully exposed to the sea-blast, the birch surprises the visitor by its healthy, happy look. For pure sand it is not adapted, but on peaty gravel or broken rock, where few other trees could survive, the birch is quite at home. Readily raised from seed, which may be sown *in situ*, hardy, fast growing, and little subjected to disease or accident, the birch for seaside planting is highly recommended.

Beech (*Fagus sylvatica*).—Where the soil is suitable and the situation not too exposed the beech succeeds fairly well as a seaside tree, and is valuable for the great amount of shelter it affords. It must not, however, be planted where lashed by the salt spray, but in partially sheltered positions. Hedges formed of the beech are most valuable for the kindly aid they give to the cultivation of half-hardy shrubs and other plants in seaside gardens. Other trees that, according to quality of soil and the amount of shelter provided, may be planted by the coast with a fair chance of success are the hornbeam (*Carpinus betulus*), the oak (*Quercus pedunculata*), which, however, is always dwarfed, and the common ash (*Fraxinus excelsior*), but they are not to be recommended for withstanding the first brunt of the ocean blast. Along the Scotch coast the oak has been found suitable for planting, but unless in favourable situations it is of dwarf, scraggy growth and of little value as a timber producer. For coppice along the Welsh seaboard it has been used with success.

Laburnum (*Laburnum alpinum*).—At many seaside situations the laburnums, both Scotch and English, will be found in a thriving condition. Along the coast of Yorkshire they both do well, and in Southern English maritime gardens they are freely planted both for ornament and shelter. Being readily raised from seed, thoroughly hardy, and of fairly rapid growth, they are to be recommended for the ornamentation of gardens by the seaside, particularly such as are not too exposed.

The Balsam Fir (*Abies balsamea*) is a good seaside tree, and probably in respect of thriving does better there than any

Laburnum by the Seaside.

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other of the family. It is comparatively tender when planted, unless in the most favoured situations.

Cherry Birch (*Betula lenta*) succeeds well by the seaside on the coast of Carnarvonshire, where it forms a tree of medium growth. The bark is black and the leaves closely resemble those of the cherry. The bark and buds have an almond-like flavour, and the wood, which is known as mountain mahogany, emits a fragrant odour. "Oil of winter-green" is got from the bark of this tree. For planting on light, sandy soil on the sea-coast, but not where open to the first brunt of the storm, the cherry birch is to be recommended.

The Paper Birch (*Broussonetia papyrifera*) is not so graceful as our common birch, but is more suitable for planting in sandy soils by the sea-coast. By the margins of the great American lakes, where there are vast areas of blowing sand, the paper birch thrives well, and is relied upon as a suitable tree for planting in such localities. It roots freely, grows rapidly, and in this country has proved to be perfectly hardy and suitable for growing on light, poor soils.

Prunus maritima (beach plum, or sand plum) is a low, straggling shrub, from 3 to 5 feet high, that is usually found in small thickets, and becomes quite prostrate where fully exposed by the seaside. It is a good shrub for sandy soils, where it runs about freely, and is recommended for planting along the coast down even to high-water mark.

CHAPTER V

SHRUBS FOR SEASIDE PLANTING

THE number of shrubs that succeed when directly exposed to the salt spray is very limited, and on that account the few that so thrive in anything like a satisfactory manner are doubly valuable from the planter's point of view. We are now referring to the shrubs that will grow when directly exposed to the winds and salt spray of the seaside. After a wind-screen has been provided, the number of shrubs that has been found to succeed is fairly large.

SEA BUCKTHORN (*Hippophaë rhamnoides*).—This is unquestionably the best all-round shrub for planting on exposed ground by the sea-coast with which we are acquainted. It forms a large, prickly, spreading bush, and does well in loose, sandy soil, though in this respect it is by no means fastidious, growing freely inland in almost any soil or situation. Strong winds and exposure to the saline blasts have no effect on this valuable shrub; indeed, the beautiful silvery tint of the willow-like leaves is never better shown off than when stirred by the breeze. As an ornamental shrub it is highly appreciated, for not only is the foliage distinct

and pleasing, but towards autumn it becomes heavily laden with bright, orange-coloured berries, which often wreath the branch-tips for a foot in length. As the sea buckthorn produces off-shoots freely, its propagation in sandy soils is readily effected. From seed, which is produced in abundance, it is also propagated.

Along the coast of Belgium the sea buckthorn is the most valuable shrub for planting on exposed sandy wastes, and in many parts of the British Isles it succeeds admirably down even to high-water mark and where its foliage is lashed by the salt spray. We were particularly struck with the way in which the buckthorn binds large tracts of the fine shifting sands along the Belgian coast, and also its rapidity of growth and free spreading habit. At Burnham on the Bristol Channel it also does well.

In Scotland, too, as by the side of the Firth of Tay, growing amongst pure sand, and where fully exposed to the ocean storms, it succeeds admirably, as also along the Welsh coast, where the Atlantic winds cause most shrubs by the sea-front to wear a battered and shorn appearance.

Tamarisk (*Tamarix gallica*, *T. germanica*, and *T. tetrandra*).—For seaside planting the tamarisk is one of our most valuable and tried subjects. It is a vigorous growing shrub, with long feathery branches that are terminated during summer with loose panicles of small reddish flowers. It delights to grow in deep, sandy, moist soil by the seaside, where it is often seen as a bush 8 to 10 feet high, and even where its roots come in contact with the salt water. Along the coast of Kent and Suffolk isolated specimens of the tamarisk may be seen growing freely close to

Tamarix Tetrandra.

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the sea and in pure sand. The German tamarisk also flourishes along our coast, and is in some localities preferred to the ordinary form, from which it differs in its longer leaves and in attaining only about half the height, while the flowers are of a brighter colour. Near the North Foreland Lighthouse some large specimens of the German tamarisk may be seen, showing how well this shrub is adapted for exposed situations by the seaside.

T. tetrandra has been very successfully employed in reclaiming sand-dunes and as shelter hedges. It is of bushy growth, growing about 12 feet high, and usually well furnished to the ground with twiggy growths.

In May, when the leaves appear, a profusion of showy pink flowers are borne in cylindrical racemes from the buds of the previous year's wood. It is undoubtedly the best of the early flowering tamarisks, and succeeds by the sea-coast in light, loamy soils, as also in almost pure sand.

All the tamarisks are readily raised from cuttings, transplant freely, and grow rapidly.

Dwarf or Creeping Willow (*Salix repens*).—Though in this country the value of the creeping willow for fixing blowing sands by the sea-coast has not been sufficiently recognised, yet on the Continent, particularly along the coast of Belgium and Holland, it has been found one of the best shrubs for this important purpose.

In company with the sea buckthorn the creeping willow covers large areas of what at one time were drifting sands between the town of Knocke and the frontier of Holland. Some of the

patches that we examined covered about a quarter of an acre of the sandy soil, and the plants rooted so deeply that even during unusually warm and dry summers they presented a decidedly green and flourishing appearance. As this willow spreads freely from the root, single specimens in a few years cover a large extent of ground.

It is readily propagated from root divisions, and we have seen an established plant divided into thirty parts for transplanting. From our experience of this willow in exposed sandy wastes on the Continent, as well as in this country, its use for maritime planting is to be strongly recommended.

Siberian Salt Tree (*Halimodendron argenteum*).—This forms an irregular, much branched, deciduous shrub about 6 feet high, though, when favourably situated, attaining to 8 feet in height. The leaves are alternate and clothed with a whitish, silky down, and the pea-shaped flowers are sweet smelling and of a bright rosy purple colour. It is readily propagated from seed or by cuttings, and occasionally, for ornamental purposes, by grafting on the laburnum. Though by no means a common shrub, the Siberian salt tree is well suited for planting by the seaside in this country, and large bushes may be seen in many of the gardens along the South Coast. It grows naturally in salt fields and saline steppes in Siberia. The name is derived from "halimos" (maritime), and "dendron" (a tree), no doubt from the fact that its native habitat is the salt fields and saline steppes near the River Irtysh, in Siberia. It was introduced in 1799.

Tree Purslane (*Atriplex halimus*).—For seaside planting

Fruit of Sea Buckthorn.

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this is a valuable shrub of rather coarse, rambling habit with half-woody branches and whitish or silvery leaves. It is totally indifferent to salt spray, to very exposed situations, or soil of opposite and inferior qualities. For seaside ornamental grounds, particularly along the southern coast of England and in Ireland, the tree purslane is often planted, but rarely in quantity for shelter-giving purposes or as a plantation shrub.

Box Thorn, or Tea Tree (*Lycium europæum*).—As a hedge plant or for rambling over rocky mounds by the seaside this is a valuable shrub. Along many parts of the coast of Wales hedges of this plant are commonly met with, and it will thrive in sand and where exposed to the full blast from the sea. Being of rather straggling, weak growth, it is all the better of support, such as that afforded by stout stakes driven in along the line of fence.

It is readily raised from cuttings or by divisions of the root, transplants freely, and soon forms a bush that, according to situation, varies from 4 to 10 feet in height—the latter size when support is provided.

Sending out suckers freely, this shrub is valuable for fixing blowing sands on the sea-coast, especially as it thrives well where constantly subjected to the salt spray, and with its roots in soil that is largely tainted with brine from the sea-water.

L. barbarum is also a useful species for planting under similar conditions to the latter.

Aucuba japonica as a seaside evergreen shrub has few equals, as it will grow freely and appear in its best form even where at

times subjected to salt spray and in cold, exposed situations. For shelter-giving it is invaluable, the stout foliage and sturdy nature of the plant rendering it proof against violent and long-continued storms by the sea-front. Being readily propagated from cuttings, and rooting freely, this shrub deserves a front place amongst evergreens that are planted for shelter by the seaside. From Wigtonshire southwards the aucuba is freely planted for ornament and shelter along the coast.

Tree Groundsel (*Baccharis halimifolia*).—Whether for ornament or as a shelter-provider, the tree groundsel is to be strongly recommended for planting in sandy or gravelly ground by the sea-coast. We have also been surprised how well this shrub thrives on the chalky downs and cliffs of Kent, and in direct contact with the sea-blast. It is, however, more frequently planted for variety and ornament than as a screen or woodland shrub.

Lonicera nitida has succeeded well by the sea-coast in the West of Scotland. It is quite unaffected by either sea air or salt spray.

Readily increased from cuttings, and a handsome shrub for maritime situations.

Laurustinus (*Viburnum tinus*).—Where a small amount of shelter is provided the laurustinus thrives amazingly along the sea-front, and there produces flowers in greater abundance than when planted in inland situations. In many of the gardens that border the English Channel this shrub is largely grown for its ornamental appearance, and being readily and quickly raised from

Snowberry at the Seaside.

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cuttings, and transplanting freely, are additional recommendations. It is certainly the most popular of flowering shrubs for gardens along the South Coast.

Euonymus japonicus is a capital seaside shrub that will succeed and look bright and healthy when planted within a few yards of the shore. In many places along the coast that we know of this shrub thrives amazingly where fully exposed to the saline-laden blast from off the sea. It will not, however, succeed if planted in sand, nor where its roots come in contact with salt water. Readily propagated, growing quickly, and furnished with the deepest green foliage, the euonymus is to be recommended as one of the best evergreen shrubs for planting in a seaside garden. At Southend and near the mouth of the Thames it is widely grown. Probably for seaside planting it is more generally in use than any other shrub.

Snowberry (*Symphoricarpus racemosus*).—This is an invaluable shrub for planting in poor soils by the sea-coast, where it soon forms, by its running roots, a tangled mass of underwood. It is of extraordinary hardihood, withstanding the cold, cutting winds direct from the sea in a most commendable way. The fruit, when freely produced, has a very telling effect on this shrub, and the tiny, pinky flowers are not to be despised. The snowberry will stand rough handling, pruning, and subdividing better than any shrub we know.

Guelder Rose (*Viburnum Opulus*).—This native shrub is one of the best for planting within the influence of the sea. All along the chalky downs of Kent, and where fully exposed to the ocean

blast, it is one of the most cherished shrubs, and often is the main component of hedges in these districts. Easily propagated, highly ornamental, and of the hardiest nature, the guelder rose is confidently recommended for planting by the seaside, particularly where the soil is mainly composed of limestone or chalk.

The Wayfaring Tree (*V. lantana*), with its young shoots and leaves covered with a soft, mealy down, and purplish black berries, is a choice subject for seaside planting.

Spanish Broom (*Spartium junceum*).—For planting on light, gravelly, or sandy soils by the sea-coast this is one of our most valuable shrubs, while at the same time it is one of the most ornamental. Along the South and West Coast it has been found of special value, and as it is of stout, robust growth and perfectly hardy, as also an excellent subject for exposed sites, has become a general favourite with planters. Very successfully also it has been cultivated from seed sown in partially reclaimed sand-dunes along the coast. The Spanish broom, which hails from the Mediterranean region, when favourably situated, attains to a height of 8 or 9 feet, and produces its fragrant yellow flowers in great abundance. It produces seed abundantly, and sown in favourable situations soon attains to a stout, well-furnished shrub. It flourishes in light, sandy soils.

St. John's Wort (*Hypericum calycinum*) and Periwinkle (*Vinca major*) are both good carpet shrubs in seaside plantations. On the Carnarvonshire coast in stiffish soils they spread rapidly, and cover the ground with their neat evergreen foliage, even in situations where the shade is fairly dense.

Viburnum Lantana, a Useful Seaside Shrub.

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Veronica Traversii is a good shrub for the seaside garden, and may be found quite established and flowering freely in many southern and western parts of our coast. Other species also do well in warm southern parts of the coast-line, but, with few exceptions, they are not to be recommended for general planting.

The shrubby VERONICA "Blue gem" is one of the best of the family for planting in open and exposed parts of the coast, where it succeeds well and flowers freely. On the west coast of Scotland, as also at Scarborough, it is considered one of the best of small-growing, ornamental shrubs for planting by the seaside.

BUTCHER'S BROOM (*Ruscus aculeatus*).—As may be seen from the numerous specimens that were planted by Pitt in the woodlands at Walmer Castle, this is an excellent shrub for seaside situations. Moreover, it can thrive in the densest shade, and is by no means particular about the quality of soil in which it is planted, and will even succeed on pure chalk. As a seaside woodland shrub the butcher's broom produces its bright, pink fruit in abundance, and being of evergreen character lights up a deciduous woodland during the dull winter season. Recommended as underwood in all seaside plantations, and readily increased by root subdivisions.

Escallonia macrantha and *E. rubra*, have few equals as ornamental flowering shrubs for planting in the seaside garden. Both may, however, be planted as specimens in the shrubbery, but they are all the better, and certainly flower all the more freely, when given the slight protection of a wall or fence. They will thrive down almost to high-water mark, and

in such situations the dark glossy foliage and wealth of crimson red flowers are particularly attractive. Though not particular as to soil, yet both the above species thrive best in that of a light and warm character. In Cornwall, particularly around Penzance, shelter hedges composed of the escallonia are frequently to be seen. Both in an ornamental and economic sense they are of much value. *E. macrantha* forms an excellent garden or screen fence, and being an evergreen is an extra recommendation. Some of the hedges near Penzance are fully 6 feet high and 2 feet 6 inches in width, and are highly prized for their ornamental appearance and as bearing pruning with impunity.

Shepherdia argentea has been found suitable for seaside planting, and along the South Coast in particular is often to be met with thriving within a few yards of the sea. This shrub is rendered of particular interest on account of the intense silvery hue of the foliage, which seems to be augmented when growing on soil of a chalky description.

Individually the leaves are narrow and lanceolate, silvery on both sides, and dotted over with rusty-brown scales, especially on the under-side.

We have succeeded well with the shepherdia on the seacoast by Dover.

Garrya elliptica thrives in many South Coast gardens, especially when used as a wall plant. It is a handsome shrub with dark green, coriaceous leaves, somewhat after those of the evergreen oak. The long, tassellated catkins, of a peculiar yellowish-green colour, render the plant one of particular interest

Olearia Haastii, an Excellent Seaside Shrub.

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and beauty. It is well to bear in mind that there are male and female plants of the garrya, and that the former is the more ornamental.

Leycesteria formosa is a good seaside shrub, and has been used with perfect success in many grounds along the coast. It is an erect-growing, deciduous shrub, with green hollow stems and large, ovate, pointed leaves of a deep green colour. The flowers are small, and white or purple, and produced in long, pendulous, bracteate racemes from the axils of the upper leaves.

Quite hardy and of rampant growth, and readily increased from cuttings. For underwood it is suitable.

Olearia Haastii is of neat growth, wonderfully floriferous, and well suited for growing where partial shelter is provided by the seaside. It is of somewhat stiff, dwarf growth, rarely exceeding 4 or 5 feet in height, but neat and compact.

The daisy-like flowers are freely produced in large, flat clusters at the branch tips. Recommended for planting by the seaside.

Phillyrea latifolia is a good shrub by the seaside, where it forms a compact and exceedingly ornamental shrub with bright, shining, ovate, serrulated leaves. Not very hardy away from the sea, but a choice plant along the South Coast. *P. Vilmoriniana* also does well in the sea-coast garden, and both species from Wigtonshire southwards are prized as shrubbery plants.

Osmanthus ilicifolius can be recommended for planting in partially sheltered grounds along the coast. This is a handsome

evergreen shrub, with holly-like leaves and rather inconspicuous greenish-white flowers. To be strongly recommended for seaside districts.

The Mock Orange (*Philadelphus coronarius*), where a small amount of shelter is provided, is valuable for seaside planting. It is a well-known shrub that, under favourable conditions, will attain to a height of 8 or 10 feet, with ovate and serrulated leaves, and pretty racemes of white or yellowish-white, deliciously fragrant flowers. Readily raised from cuttings and perfectly hardy.

Forsythia suspensa and *F. viridissima* are excellent rambling shrubs for the seaside wall or pergola. They are slender growing shrubs, with variable leaves and long trailing shoots. The abundantly produced flowers are bell-shaped and of a beautiful golden tint, and, being of good substance, last for a long time.

Valuable as thriving well by the seaside where shelter from cold winds is provided.

Deutzia crenata rarely produces its flowers in such quantity as when growing in a sheltered nook by the seaside. It is a very distinct shrub of noble port, and when in full flower is certainly one of the most ornamental of hardy plants. The double-flowered variety, *D. crenata fl.-pl.*, is more beautiful than the species, and is equally valuable for planting in the seaside garden.

The Weigelas are not to be despised for planting by the seaside, where they succeed admirably and flower freely.

Mixed Shrubbery at Seaside.

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Cotoneaster Simonsii is a capital seaside shrub which usually grows 4 or 5 feet high, with a sub-erect habit and roundly elliptical leaves that are slightly silky on the under-sides.

It is rendered particularly attractive by reason of the scarlet berries with which the shoots are often thickly wreathed in the autumn and early winter. For planting amongst stony débris this cotoneaster seems to be well adapted, and is a reliable wall plant in almost every situation.

By the sea-coast, even in cold, bleak aspects, it is a valuable shrub that can be confidently recommended.

Rosemary (*Rosmarinus officinalis*) is a choice, small-growing shrub for seaside planting. It is a familiar plant of dense growth with dusty grey leaves and pale blue or white flowers. At Walmer Castle, on the sea-coast, there is a much-admired rosemary hedge 70 yards long and 4 feet high by a yard wide.

Privet (*Ligustrum ovalifolium*).—For planting within the influence of the sea this is a valuable plant, and is probably more often found in the sea-coast shrubbery than any other shrub. For hedge purposes or clump planting for shelter it is often and successfully employed. The Common Privet (*L. vulgare*) must not be despised as a seaside shrub, where it succeeds admirably and is usefully employed for many purposes. Being cheap, hardy, and readily raised from cuttings are additional recommendations. The golden privet is also useful for the seaside garden.

The Common Juniper (*Juniperus communis*) thrives well on the sea-coast, especially when on elevated and sloping banks. By the Granville Hotel, at St. Margaret's Bay, in Kent, it forms

quite a dwarf carpet to the chalky cliffs, and seems little the worse of the full exposure to which it is subjected.

It does not grow tall and lanky in such situations, but creeps along the ground, which it covers with a stunted growth rarely over a foot in height. For such situations by the seaside this juniper can be recommended.

J. virginiana, and particularly the variety *J. virginiana tripartita*, are excellent seaside subjects, and form nice specimens down even at high-water mark.

The variety is especially valuable for sea-coast planting, where it forms a dense, low shrub, with sharp-pointed leaves that are of a beautiful glaucous tint.

Yucca gloriosa and *Y. filamentosa* are handsome shrubby plants for growing by the seaside, where they soon attain to a goodly size and produce their conspicuous flowers. Along the South Coast both species have been freely planted for the tropical effect they produce. In light, sandy loam and quite close to the beach these species are recommended for planting.

Berberis stenophylla and *B. Darwinii* are both good seaside subjects where the soil is suitable and a small amount of shelter provided. Being highly ornamental, both in flower and fruit, they are recommended for the more dressy parts of the seaside garden.

Ceanothus Veitchianus has been used successfully for planting by the seaside, where it succeeds admirably and flowers with the greatest freedom. As a wall plant it is perhaps shown off to best advantage, for then the deep blue, abundantly produced

Yucca Gloriosa.

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flowers are most exposed to view. It is a shrub of free growth, and readily propagated by means of cuttings.

C. azureus also thrives in a satisfactory manner when exposed to the sea-breeze.

Lavender is particularly suited for planting by the sea, where it forms excellent dwarf screen fences and garden subdivisions. It will grow well within a few yards of the shore, and where at times exposed to the saline-laden spray.

Broom (*Cytisus scoparius*).—For planting with the cluster pine in shifting sands by the seaside the common broom is an invaluable shrub. Seed-sowing is in such cases usually resorted to, and as the plant succeeds amongst pure sand its growth is rapid and the amount of shelter afforded to the seedling pines is very considerable.

Gorse (*Ulex europæus*).—This shrub does well when planted in sandy loam, and quickly forms a hedge or screen on very exposed situations. Seed-sowing is to be recommended in the case of the gorse, which is a difficult shrub to successfully transplant, owing to the few fibrous roots with which it is furnished, and for which reason pot culture is usually resorted to. We have formed some excellent seaside wind-screens by sowing seeds of the gorse and broom on top of a raised mound or dyke of earth, or, failing such, in protected sand-drifts only a few yards from high-water mark.

The Hawthorn (*Cratægus*) must on no account be omitted from any list of seaside shrubs, for it can certainly thrive in the most exposed situations all along the coast.

Dwarfed and stunted though it may appear, yet it flourishes amazingly, and that, too, in situations where only the common gorse can hold its own in face of the violent and long-continued storms to which many parts of our coast are almost constantly subjected. At the Lizard, near the Land's End, the gorse and thorn eke out an existence where no other shrub could succeed.

For garden planting in maritime situations Paul's crimson thorn is to be recommended; while the cockspur, an American species, does equally well.

Holly (*Ilex aquifolium*) and its golden variety both make excellent wind-screens on exposed ground near the sea, but not in pure sand and where lashed by the salt spray. For mixing with other small-growing trees, such as the laburnum and beam tree, the holly is of considerable value in seaside plantations.

Minorca and Hodgin's Holly (*I. balearica* and *I. Hodginsii*) are two excellent evergreen shrubs for seaside planting. Both succeed at many places along the coast—indeed, are special favourites with planters in almost every part of the country. Where a small amount of shelter from the direct sea-blast is afforded, and in light, loamy soil, both species are of special value and to be recommended. They impart a great amount of shelter to other shrubs, while as ornamental subjects their value is well known.

The Spindle Tree (*Euonymus europæus*) thrives well at many points along the coast, and in such situations produces its conspicuous fruit more freely than in inland situations. It is a shrub or small-growing tree of hardy and robust constitution,

Bay Tree for South Coast Gardens.

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and succeeds well in the shade, even in exposed situations. Out of the direct influence of the salt spray it grows freely and is valuable, as it will succeed in soil of very opposite qualities, even in that of a stiff clayey description. Readily propagated from seed or by cuttings. Along the Scotch coast the spindle tree is highly thought of for seaside planting.

The Mezereon and Spurge Laurel (*Daphne mezereum* and *D. laureola*) are both suitable for seaside planting, and have the additional recommendation in that they thrive beneath the shade and drip of trees. As ornamental flowering shrubs both, but particularly the mezereon, are well known and justly appreciated. Raised from seed or cuttings.

Lilacs are good seaside shrubs where shelter is provided, but they will not succeed where subjected to the first brunt of the storm. The common lilac (*Syringa vulgaris*) is perhaps the best, though the Persian (*S. persica*) also succeeds and flowers freely in many seaside gardens along the southern and western coast.

Sweet Bay (*Laurus nobilis*).—When not directly exposed to the sea-breeze the sweet bay is a valuable shrub for garden and shrubbery furnishing all along the coast. On the south shore it does best, and may often be seen from 10 to 15 feet in height, and wide spreading in proportion.

Flowering Currant (*Ribes sanguineum*).—As an ornamental flowering shrub of moderate growth for gardens by the seaside this can be highly recommended. It is of the simplest culture, being readily and quickly raised from cuttings, hardy in

the coldest situations, and one of the most beautiful and desirable of small-growing, deciduous shrubs.

Tree Mallow (*Lavatera arborea*).—A capital subject for seaside planting, where it often attains to a height of 10 feet and flowers freely. It has been found of the greatest value for planting on some of the islands along the Scottish coast.

The Portugal Laurel does well in many of the South Coast gardens, and also along the west of England and Scotland. It is an excellent, free growing, small tree for planting in sheltered positions by the seaside, thriving well as it does in a moist, saline-laden atmosphere.

Fabiana imbricata does well in many Devon seaside gardens, and is a most effective shrub whose hardihood when subjected to severe frost cannot, however, be depended on.

Fuchsia Riccartoni and *Hydrangea hortensis* grow to large size on seaside grounds at Penrhyn Castle, in Wales, as also where directly exposed to the Channel gales at Folkestone, Hythe and Walmer.

Lemon-Scented Verbena (*Aloysia citriodora*) in many Devon gardens does well; while the Pittosporums, particularly *P. undulatum* and *P. Tobira*, have stood unharmed in several southern and Welsh sea-coast grounds for many years.

Buddleia globosa.—In many South Coast gardens where not fully exposed to the sea-blast this shrub thrives in a satisfactory way, particularly when used as a wall plant. But even as a standard and within range of the saline blast it is one of the best of seaside shrubs. For ornamental effect it has few equals.

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Weymouth Pine at Bournemouth.

Cordyline Australis on the Isle of Man.

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Rock Rose (*Cistus ladaniferus*).—For rockwork or as a ground carpet in warm soil by the seaside this dwarf shrub is to be recommended.

The Sloe or Blackthorn (*Prunus spinosa*) forms an impenetrable jungle when planted in poor soil and in exposed situations along the coast. As a shelter giver it is highly recommended, while it will stand any amount of abuse and is perfectly hardy. In many plantations along the Welsh coast the blackthorn is the principal underwood, and as it succeeds in light, sandy, or gravelly soils is particularly adapted for using in conjunction with the tamarisk or sea buckthorn. It forms an impenetrable fence or hedge, thus rendering the plant doubly valuable for open shore planting.

Cordyline australis grows to a large size and without the slightest protection on the Isle of Man, where it flowers freely and ripens seed all over the island. The flowers have a delicious lily-like fragrance.

Rosa rugosa spreads far and wide on a sandy bank in Wigtonshire. Established on pure sand and exposed fully to salt-laden winds it blooms with the greatest freedom; indeed, seems all the healthier and happier for the poor soil and exposed situation where it has become established. Can be thoroughly recommended as a seaside shrub for covering sand-banks and wastes. *R. spinosissima* is also valuable for seaside planting.

Lonicera nitida has succeeded well as a wall shrub in the West of Scotland. It would appear to be particularly suitable for planting by the seaside, where it flowers freely.

In warm, sheltered parts of the coast of Anglesea—as at Glyn-y-garth and Rhianfa—many shrubs that are not here enumerated have succeeded well and suffered but little during the past twenty years, but such are not to be recommended for general planting.

Genista monosperma from the Mediterranean coast is often planted on dunes as an effective sand-stay. It will succeed in almost pure sand, and has been found well adapted for planting along the south and west coast of this country. The flowers are white.

Rosa pimpinellifolia thrives well on dunes, and is to be recommended for planting anywhere along our coast. It has widely creeping underground stems, and is usually found not far from the sea.

Atriplex cinerea is a small branching shrub, whitish with a scaly tomentum, that succeeds well by the coast when planted in fixed sands.

Calphaca wolgarica is a deciduous shrub about a yard high, a native of Siberia and European Russia, where it grows in dry, gravelly soils near the Rivers Volga and Don. The bright yellow flowers are pea-shaped ; the leaves alternate, pinnate, and terminated by a small, acute, spine-like point. The seed-pods are oblong, with a bristle-like point, stalkless, and beset with soft hairs when young, and of a bright reddish colour. It has been found well suited for culture in sandy and gravelly soils in this country.

Myrica californica is a stout, densely branched evergreen that occurs on sand-dunes on the coast of California. It suc-

Broom for Sandy Maritime Wastes.

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ceeds well in this country, and is to be recommended for planting in seaside gardens. The foliage is deliciously fragrant.

Spiræa adiantifolia and *S. ariæfolia* are useful seaside shrubs in sheltered sites, and are both highly ornamental from a flowering point of view.

The Chilian Myrtle (*Myrtus Luma*) is a good seaside shrub, and thrives well even as far north as Wigtonshire. Though neither foliage nor the plentifully produced white flowers have the fragrance of the European myrtle, yet the shrub succeeding so well by the seaside renders it of particular value as a beautiful evergreen.

The following are recommended by the American Government for planting in sandy wastes: Sand cherry (*Prunus pumila*), *Convolvulus repens*, cherry birch (*Betula lenta*), *Robinia Pseud-acacia*, *Populus alba*, *P. balsamifera*, and *P. monilifera*; also species of willow.

Grasses for the Seaside.

The Maram or Sea Matweed (*Psamma arenaria*) has been found a most useful grass for binding shifting sands on the sea-coast. We have used it with perfect success along the coast of England and Wales; and who has not heard of the reclamation of thousands of acres of rolling sands along the coast of France and Belgium by means of the same plant? It usually attains to a height of 2 to 2½ feet, much depending on the site and exposure. The root-stock runs widely, some of those that have been followed up in the sand being of the amazing

length of 35 yards. Amongst loose, dry, drifting sands the running roots find what is most suitable for their welfare, and owing to rooting deep the plant is never affected by prolonged heat and drought. The method of planting subdivisions of old roots of the maram is as follows: Place the plant in parallel lines about 16 inches apart and 12 inches from each other, and to a depth of 10 inches in the sand. The quickest way is to stretch a garden-line along the ground, take out a notch to the required depth, place the tufts of grass in position, and fill in and firmly tramp the sand in the trench.

Lyme Grass (*Elymus arenarius*) is also valuable for planting in pure sand by the sea-coast, and should be treated as is recommended for the maram. It is of tall, elegant growth, readily subdivided, and roots quickly and firmly. For general seaside planting we prefer and have had best results by using the maram.

Spartina Townsendii is a most useful grass for covering salt marshes and mud flats. It quickly forms large clumps or beds 4 feet high, the leaves or spikelets about 9 inches long, sub-erect and rigid. The colour is a light green and delicately pubescent. This grass spreads with great rapidity, and though only recorded in this country in 1870 extends at present along the East Coast from Southern Lincolnshire to the Thames, and on the South Coast from Chichester to the Solent. On the mud banks of the Hampshire coast it is particularly abundant. *S. stricta* is of smaller and more upright growth, rarely exceeding 18 inches in height, though usually 9 inches to 12 inches, with very vigorous stolons. *S. alterniflora* rises to a yard in height.

Spartina Townsendii and *S. Stricta* for Reclaiming Mud Flats.

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All are most useful for covering exposed stretches of mud flats by the coast. The illustrations are by permission of the *Gardener's Chronicle.*

Sea Scirpus (*S. maritimus*), which is common all along our coast, has a creeping root and attains to a height of 4 and even 5 feet. Its favourite haunts are salt marshes and mud flats along the banks of large rivers, where it acts beneficially in binding and hardening the soil.

CHAPTER VI

CLIMBING AND WALL PLANTS FOR THE SEASIDE

PROMINENT amongst climbing and wall shrubs for seaside planting are the virginian creeper, clematis, honeysuckle, common ivy and box, thorn or tea tree. All seem wonderfully adapted for withstanding severe storms by the seaside, and all can survive where the foliage is subjected at intervals to the spray of salt water, which proves fatal to shrub growth generally.

THE VIRGINIAN CREEPER (*Ampelopsis virginica*) is a valuable and most useful shrub for covering buildings, earth mounds, tree stumps, or other objectionable objects within the influence of the sea. Being perfectly hardy, and growing well in the poorest of soils, this creeper is peculiarly suited for general planting, while being able to thrive in maritime situations give it additional value to the seaside planter. Unlike *A. Veitchii*, the virginian species requires to be nailed to the wall or building, but on pergolas or amongst tree branches it runs freely. Almost everywhere along the coast the virginian creeper may be found succeeding well as a wall and house plant.

A. Veitchii also does well as a wall plant in the seaside

districts, where it quickly covers a large area of buildings, especially in not too exposed situations.

The Common Ivy (*Hedera Helix*) is one of the greenest and most charming of seaside plants, where it grows and spreads with the utmost freedom. In seaside plantations it is often found to be a nuisance, so persistently does it spread over the ground and ascend the adjoining trees. Of the many beautiful varieties of ivy, all are well adapted for planting in the seaside garden, where they always look bright and cheerful.

Muehlenbeckia complexa is a New Zealand shrubby polygonum that succeeds well by the seaside. Planted against a quickly sloping bank or along with ivy at the root of a tree, this "complex puzzler," as it has been named, soon becomes a thing of grace and beauty that is quite distinct in habit and foliage from any other climbing plant of our acquaintance.

It is of rapid growth, shooting up to 10 feet or 12 feet in height in a few years, with plentifully produced minute leaves; indeed, it is one of the most distinct and interesting of all trailing shrubs. At Penzance, in Cornwall, and in the Isle of Anglesea, where fully exposed to the saline-laden blasts, this interesting shrub succeeds admirably, as do also the common and purple-leaved vines.

Honeysuckles of several kinds do well by the seaside, particularly the scarlet trumpet (*Lonicera sempervirens*) and our native species. For clambering over tree roots, or as a wall plant and for pergola purposes, both are adapted, and can be planted with safety down even to high-water mark.

Vines by the Seaside.

To face page 104.

Ceanothus Veitchiana.—For covering walls by the seaside this may at once be described as a useful and beautiful shrub. In such a position it is quite at home ; in fact, produces a larger quantity of flowers than when grown in inland situations. Several varieties of ceanothus are to be recommended for the seaside garden, but the above species is probably the best and most ornamental.

Buddleia globosa does nowhere so well or flowers so freely as when planted in not too exposed situations by the seaside. Regarding its merits as an ornamental flowering shrub, whether used as a wall plant or standard, it is unnecessary to speak, the wealth of globular orange or yellow flowers being justly appreciated. It succeeds well in gravelly loam.

Garrya elliptica.—As an ornamental wall covering this evergreen shrub is very suitable for seaside planting, while the long, tassellated catkins render it one of the most distinct of hardy shrubs. The slight protection afforded by a wall favours the growth and expansion of the catkins.

Escallonia Philippiana is greatly valued in certain districts as a wall plant by the seaside. It is of long and lithe growth, sub-evergreen, and bears tiny white flowers in great abundance. For planting against a fence or wall, in sunshine or shade, this handsome shrub, which is of moderate growth, is to be highly recommended. It should have a free, light, loamy soil in which to grow, and as it bears pruning can be kept in bounds as required. Other species are also valuable, such as *E. rubra* and *E. macrantha.*

Wistaria chinensis succeeds well as a seaside wall shrub, and justly ranks amongst the most beautiful and hardy of climbers. The purplish-lilac flowers are produced in long, drooping racemes during early summer, and impart a most pleasing and ornamental appearance to well-developed specimens.

There are few gardens along the South and West Coast where the Chinese wistaria is not to be found, and on the old castle wall at Walmer grows a sturdy and free-flowering specimen of unusually large size.

The Tea Tree (*Lycium chinensis*) is completely naturalised along the shores of the Bristol Channel at various parts of the Somerset coast, as well as inland. Though of straggling habit, when covered with its oblong red berries this shrub is quite attractive, though the dull purple flowers can hardly be classed as beautiful. Will succeed in the poorest of soils and where fully exposed to the saline blast, and is valuable either as a wall plant or for rambling over roots and rocks.

The Common Fig is an excellent strong-growing shrub for planting by the seaside, where it grows freely and produces fruit in abundance. For covering a wall or clambering over woodwork it is especially valuable, and, being perfectly hardy, is to be generally recommended for the South and West Coast in particular.

Clematis montana and *C. viticella* both do well at Deal and Walmer, and are to be recommended for general use by the seacoast. But, indeed, most of the hybrid clematis grow with unwonted freedom and flower freely in the seaside garden.

CHAPTER VII

HERBACEOUS AND ALPINE PLANTS FOR THE SEA-COAST

THOUGH many of these flourish when sheltered from the direct sea-blast and saline-laden spray, yet the number that succeed when fully exposed to the first brunt of the storm is by no means large. As with both trees and shrubs, a little shelter spells all the difference between success and failure in the cultivation of alpine and herbaceous plants in the seaside garden. Soil is, of course, an important factor, and particular attention to such is all the more necessary where the climatic conditions are unfavourable. That certain plants will thrive when subjected to the most exposed seaside situations—in fact, where they are at times drenched with salt spray—is well known, and this fact has been taken advantage of in the laying out and planting of grounds by the seaside. Several species of armeria, sedum, echium, valeriana, convolvulus, and other plants actually revel when planted on the foreshore and under the most trying conditions; while, amongst grasses and allied plants, quite a number will succeed in soil that is flooded at high tide—indeed, several species will only thrive when so situated.

Then, of such as are most at home in pure sand by the seaside the list is quite a long one. On the rocky ledges jutting far out into the sea at the South Stack Lighthouse, at Holyhead, the thrift (*Armeria*) is quite at home, and lights up this otherwise inhospitable region with its masses of pinky flowers. Where the smallest quantity of soil gets established between the rock fissures at the Land's End the sedum finds a congenial home; while on beds of solidified gravel at high-water mark the beautiful *Convolvulus Soldanella* runs rampant in company with the viper's bugloss (*Echium*), sea or horned poppy (*Glaucium luteum*), bladder campion (*Silene*), and hosts of other plants, thus showing that by careful choice a collection of both interesting and beautiful flowers will succeed to perfection under the trying ordeal of wind exposure and a salt-laden atmosphere.

Amongst the taller-growing and more showy of herbaceous plants the various forms of aster have been found well suited for planting in the borders of the seaside garden, where they grow stout and stubby and flower freely. *Anchusa italica*, the Dropmore variety, is a showy seaside plant with bright blue flowers and a taller and better habit than the species. The well-known autumn flowering *Anemone japonica*, as also the variety *A. elegantissima*, are capital seaside plants that, given a good loamy soil, soon increase in the seaside garden. *Bocconia cordata*, of noble growth, and bearing quantities of brownish feathery flowers, is nowhere seen to better advantage than when planted within the influence of the sea. Both *Coreopsis lanceolata* and *C. grandiflora* are well suited for a similar place to the last mentioned.

Delphiniums also do well, two of the best being the Queen of Spain and celestial, the latter bearing large light blue flowers with a conspicuous pure white eye. The burning bush (*Dictamnus fraxinella*) and *D. caucasicus*, bearing spikes of red flowers, are both well suited for the seaside garden, as are also *Doronicum Harpur Crewe* and the beautiful varieties of eryngium, particularly *E. amethystinum*.

Of iris, several species can be ranked as amongst the best of plants for exposed seaside situations, and as they are indifferent to the quality of soil in which they are planted may justly rank as the least fastidious of hardy garden plants. The best are *I. florentina*, Her Majesty, La Beauté, May Queen, *I. pallida*, *I. dalmatica*, *I. sibirica*, and *I. ochroleuca*. *Galega officinalis*, with its pale lilac, pea-shaped flowers, does well where a little shelter is afforded, as does also the beautiful *G. Hartlandi*, with blue and much larger flowers than the parent plant. Geranium species are choice plants for the seaside, especially *G. lancastriense*, *G. lividum*, and *G. nodosum*. A light, free soil will suit them best. Where shelter from cold winds is afforded some species of gypsophila do well, one of the best being *G. cerastioides*, a dwarf, trailing plant with graceful habit and white flowers. *G. paniculata* is also to be recommended, and *G. repens rosea*, with pale pinky flowers and a hardy constitution. Of heleniums the best for seaside planting are *H. Bolanderi*, *H. cupreum*, *H. pumilum*, and that decided acquisition *H. pumilum magnificum*, with large, deep yellow flowers and a sturdy habit. *Hemerocallis flava* is a good subject for the exposed seaside

border, and *Heuchera sanguinea*, with its slender, nodding spikes of coral-coloured flowers, should also find a place, for it usually flowers freely when not too exposed. With its free growth and beautiful rose-pink flowers *Lavatera olbia* is one of the showiest of seaside garden plants; while the tree lupin (*Lupinus arborea*), with its sulphur-yellow flowers, is a choice subject for the partially sheltered herbaceous border.

The lychnis family do well by the seaside, particularly *L. chalcedonica* and *L. viscaria splendens plena*, with double purple flowers. Montbretias, such as *M. speciosa*, *M. Pottsii grandiflora*, and the bronzy flowered *M. pyramidalis*, are all suited for the herbaceous border, and succeed well along the coast. The mulleins (*Verbascum*) have proved themselves good seaside subjects; while the veronicas, including *V. elegans*, *V. gentianoides*, *V. longifolia*, and *V. spicata*, could not be excelled for their beauty and adaptability for the seaside garden.

Of dwarf or alpine plants quite a number have been found suitable for cultivation by the seaside, and a few would almost appear to revel where fully exposed to the first brunt of the storm, and where the foliage is at times subjected to the saline-laden spray. The thrifts (*Armeria*) are not excelled by any other plant for exposed sites by the seaside, the best being *Cephalotes rubra* and *C. maritima*. For edging beds and borders the tufty, compact growth renders both probably the most valuable for such positions, where their brightest of red and pink flowers cause them to rank high amongst ornamental plants

of dwarf growth. *Arnebia echioides*, the prophet flower, has been largely cultivated in nurseries by the seaside, as it has been found to succeed well under such conditions. *Antennaria hyperborea* for edging purposes has few equals, and *Arabis alpina fl.-pl.* is one of the showiest of seaside cushion plants.

The best campanulas, all of which do well when partially sheltered, are *C. carpatica*, *C. garganica*, *C. turbinata*, *C. lactiflora*, and *C. Van Houttei*. Of the rock roses (cistus) several kinds do well, as do also *Dianthus alpinus* and the beautiful *Erica carnea*. *Hepatica triloba*, with its showy blue flowers, may often be seen in good condition by the seaside. *Hieracium aurantiacum* is also to be recommended, and for wall-covering our native *Linaria cymbalaria*, the toadflax, is hard to beat. On the most open and exposed chalk cliffs near Dover the restharrow (ononis) flowers freely, and is a charming plant of dwarf, creeping habit. *Plumbago Larpentæ* is largely used in seaside gardens, for not only are the flowers showy, but the autumn foliage tint is quite attractive. Of saxifrages several kinds have proved suitable, some of the best being *Saxifraga Aizoon*, *S. Wallaceii*, *S. Bucklandi*, and the London pride, *S. umbrosa*. They are useful for carpeting and edging. Sedums would include our native *S. acre*, *S. glaucum*, and *S. japonicum*; while *Thymus carneus* and its variety *T. coccineus* are amongst the best and most showy of dwarf plants.

The following list of plants has been drawn up by Messrs. Clark, nurserymen, Dover, who have probably had more to do with the furnishing of seaside gardens along the South Coast

than any other firm, and whose experience is therefore of the greatest value :

Achillea filipendula.
„ millefolium roseum.
„ „ Cerise Queen.
Aconitum Fischeri.
„ napellus bicolor.
Ajuga Brockbanki.
Alstrœmeria aurantiaca.
Alyssum saxatile.
„ „ fl.-pl.
„ „ Nanum compactum.
Anchusa italica, Dropmore variety.
„ „ Opal.
„ „ Pride of Dover.
Anemone japonica alba.
„ „ elegantissima.
„ „ rosea superba.
Antennaria dioica rubra.
„ hyperborea.
„ tomentosa.
Anthemis macedonica.
Arabis alpina fl.-pl.
Arenaria balearica.
Armeria cephalotes.
„ maritima.
Arnebia echioides.
Artemisia lactiflora.
Asperula odorata.
Aster alpinus.
„ subcœruleus.
„ acris.
„ amellus bessarabicus.
„ „ Major.
„ „ Riverslea.
„ Beauty of Colwall.
„ Coombe Fishacre.
„ diplostephioides.
Aster ericoides.
„ Glory of Colwall.
„ King Edward.
„ mesa grandiflora.
„ novæ belgii apollo.
„ Peggy Ballard.
Aubretia tauricola.
„ Violet Queen.
Auricula (alpine).
Betonica grandiflora superba.
„ spicata.
Bocconia cordata.
„ microcarpa.
Campanula carpatica.
„ garganica.
„ glomerata dahurica.
„ grandiflora.
„ „ alba.
„ lactiflora.
„ persicæfolia.
„ „ alba.
„ Portenschlagiana.
„ turbinata.
„ Van Houttei.
Centaurea glastifolia.
„ macrocephala.
„ montana.
„ pulcher major.
„ rigidifolia.
Centranthus alba.
„ coccineus.
Cerastium Biebersteinii.
„ grandiflorum.
„ tomentosum.
Chelone barbata.
Cistus algarvensis.

Coreopsis grandiflora.
„ lanceolata major.
Delphinium, King of Delphiniums.
„ Queen of Spain.
Dianthus alpinus.
Dictamnus caucasicus.
Doronicum austriacum.
Echinacea atropurpurea.
Echinops Ritro.
Epilobium angustifolium roseum.
Erica carnea.
Erigeron aurantiacus.
Eryngium amethystinum.
„ tripartitum.
Gaillardia grandiflora.
Galega officinalis.
Gentiana acaulis.
Geranium grandiflorum.
„ nodosum.
„ pratense plenum.
Geum coccineum, Mrs. Bradshaw.
„ Ewani.
„ Heldreichi splendens.
Gypsophila cerastioides.
„ paniculata.
Helenium Bolanderi.
„ cupreum.
„ grandicephalum.
„ pumilum magnificum.
„ Riverton Beauty.
„ „ Gem.
Helianthus multiflorus.
„ „ fl.-pl.
„ rigidus, Miss Mellish.
Hemerocallis flava.
„ japonica.
Hepatica triloba.
Heuchera, Edge Hall.
Hieracium aurantiacum.
Hieracium rubrum.
Hypericum Moserianum.
Iberis, Perfection.
„ Snowflake.
Inula ensifolia.
Iris germanica florentina.
„ „ Her Majesty.
„ „ La Beauté.
„ „ Madam Chereau.
„ „ Maori King.
„ „ Mrs. Neubronner.
„ „ May Queen.
„ „ pallida.
„ „ „ dalmatica.
„ Monspur.
„ sibirica.
Isatis glauca.
Isopyrum thalictroides.
Lavatera Olbia.
Linaria cymbalaria.
Linum Lewisii.
Lupinus arboreus.
Lychnis chalcedonica.
„ viscaria splendens plena.
Megasea cordifolia purpurea.
„ Stracheyi.
Montbretia aurea.
„ Pottsii.
„ pyramidalis.
„ speciosa.
Œnothera speciosa.
Olearia Gunniana.
Omphalodes cappadocica.
Ononis rotundifolia.
Orobus vernus.
Papaver orientale.
Phlox amæna.
Plumbago Larpentæ.
Pulmonaria officinalis.

Pyrethrum uliginosum.
Rosmarinus prostratus.
Rudbeckia, Autumn Glory.
„ maxima.
„ Newmanii.
Saxifraga Aizoon.
„ „ lutea.
„ „ rosea.
„ Bathoniensis.
„ densa.
„ Guildford Seedling.
„ Wallaceii.
„ Bucklandi.
„ oppositifolia.
„ umbrosa.
Scabiosa alpina.
Scolymus grandiflorus.
Sedum acre Comolli.
„ „ glaucum.
„ „ japonicum.
„ spectabile.
„ turkestanicum.
Sedum virens.
Soldanella alpina.
Solidago, Golden Wings.
„ multiradiata.
Statice incana.
„ latifolia.
Thalictrum Delavayi.
Thermopsis montana.
Thymus carneus.
„ coccineus.
Trollius caucasicus.
„ europæus.
„ giganteus.
„ japonica.
Verbascum Chaixii.
„ densiflorum.
Verbena chamæridifolia.
Veronica elegans.
„ gentianoides.
„ longifolia.
„ spicata.
Yucca filamentosa.

CHAPTER VIII

NATIVE SEASIDE PLANTS

AMONGST smaller-growing plants that have been found suitable for cultivating on sandy and gravelly wastes by the seaside the following are recommended for their value in assisting to bind such soils:

Sea Heath (*Frankenia lævis*) is a much-branched perennial or under-shrub that occurs in maritime sands and salt marshes along the southern and south-eastern coast of England, and is valuable as thriving in such situations.

Sea Holly (*Eryngium maritimum*).—This occurs all along our coast growing in pure sand down to high-water line. It is a stiff, erect, much-branched plant, about 15 inches high, with globose heads of blue flowers that are quite ornamental. It is valuable as growing in the most exposed parts of the coast, and assisting in reclaiming shifting sandy soils.

Sea Rocket (*Cakile maritima*).—A half-shrubby plant, with loose straggling branches that rise to a foot or more in height. It is common all around the coast, occurring in sandy marshes, and valuable for binding the loose sands at high-water mark.

Seakale (*Crambe maritima*).—Plentiful along the South Coast, especially on the chalk cliffs of Kent. It grows freely on the Dover coast, forming stout, branched heads a couple of feet in height where subjected to the salt spray. Valuable as thriving in such situations.

Sea Lavender (*Statice Limonium*).—Frequent along the coast, where it helps to clothe sandy soils where only a limited number of plants could succeed.

Sea Milkwort (*Glaux maritima*).—This is of low, decumbent growth with a creeping root-stock, and is valuable for clothing muddy flats by the seaside. It spreads rapidly, and though recommended for muddy flats is yet quite at home and grows freely on sandy and gravelly soils by the seaside.

The Horned or Sea Poppy (*Glaucium luteum*).—Very common along the southern coast, where it grows in pure sand or gravel, and though of annual duration reproduces its kind freely from seed. The leaves are thick and leathery, very glaucous, and covered with short prickly hairs. As an ornamental plant the horned poppy is held in esteem, the bright yellow flowers being freely produced in succession. The fruit pod has a fancied resemblance to a horn, being 8 to 10 inches long and crowned by the spreading lobes of the stigma.

The Viper's Bugloss (*Echium vulgare*) is a handsome plant of robust growth, and bearing showy reddish-purple flowers which with age turn to a bright blue. On the southern coast it is plentiful, growing amongst sand and shingle, though by no means averse to soil of a richer description.

The Purple Echium (*E. violacea*) is found sparsely by the sea-coast, and is even more ornamental than the former.

The Sea Purslane (*Arenaria peploides*) has a creeping root-stock with procumbent forked flower stems. Occurs in maritime wastes and sandy places along the coast, and is valuable for binding the soil in which it grows.

Salicornia herbacea is a half-woody plant destitute of leaves, which occurs in salt marshes and dampish grounds along the coast. It sends out branches from the nodes which, taking root, soon spread about to a considerable extent, and assist greatly in fixing the loose soil in which the plant delights to grow. It is known as the glasswort, and rarely exceeds half a foot in height.

Atriplex portulacoides is of low, spreading habit, and may be ranked as an under-shrub. For growing along the sea-coast in light, sandy, or gravelly soils it is valuable.

The Broad-Leaved Helleborine (*Epipactis latifolia*) covers vast tracts of sandy soil in maritime plantations along the Belgian coast. It is of erect growth, often a yard high, with broadly ovate leaves and spikes of purple and green flowers. Amongst the woods of *Pinus Pinaster* near Knocke and along to the frontier of Holland this plant occurs in great quantity, sometimes over a hundred plants growing beneath a single tree. The running matted roots act as a binder of the sandy soil. Common near the Carnarvonshire sea-coast, between Bangor and Aber.

Thrift or Sea Pink (*Armeria maritima*) is an excellent plant for alpine gardening or covering rocky soils by the sea-coast. As an ornamental plant, when studded with its pinky

flowers, the thrift is one of our most valuable subjects, and as it can be subdivided to a great extent increase, where necessary, is rapid. For chalk soils it is specially adapted, and forms an excellent edging to the hardy border or kitchen garden. For coast planting it is most desirable, and extends farther seaward than perhaps any other plant.

The Sea Spleenwort (*Asplenium marinum*) is the only member of the fern family that can thrive when subjected to the sea-spray. On warm, sheltered, rocky ledges and in caves along many parts of the coast the marine spleenwort is a most valuable plant, and as it spreads freely from seed soon carpets a considerable area of the rocks on which it is growing.

The Stonecrop (*Sedum acre*) is a good carpet plant for sandy and gravelly soils by the seaside, where it grows freely and greatly aids in fixing the loose soils. This plant extends farther seaward than perhaps any others, not even excepting the thrift.

The Sea Convolvulus (*C. Soldanella*) is a prostrate, scarcely twining herb, with thick, rounded, kidney-shaped leaves and pink flowers. It is excellent for carpeting sands by the seaside, where it flourishes amazingly, and is one of the brightest gems of the family when in flower. No part of the coast is too exposed for this plant, and the driest and hottest sands seem to afford it the necessary sustenance for a flourishing existence.

The Sea Samphire (*Crithmum maritimum*) has thick fleshy foliage and stems, and rises to about a foot in height. It is particularly abundant in clefts of the chalk rocks by Dover and along the coast to St. Margaret's Bay on the one side, and towards

Folkestone on the other. Quantities are annually collected for pickling.

The Sea Spurge (*Euphorbia paralias*), though not found all around our coast, occurs in some plenty on the southern shores of England and Ireland. It is of perennial growth, with a short, almost woody stem that often rises to a foot in height, and is valuable as growing in pure sand by the seaside.

Polygonum maritimum, the sea polygonum, is common on the coast, and may often be found with a woody stem of perennial duration with short, thick branches.

The Frosted Orach (*Atriplex rosea*) is an excellent plant for the seaside, with broadly triangular leaves that are covered with a white scaly meal.

The Glasswort (*Salicornia herbacea*) occurs in plenty along the coast, particularly in muddy flats and salt marshes.

Sea Plantain (*Plantago maritima*) is a valuable plant for stony and rocky parts of the coast, though it will also succeed in almost pure sand or gravel. The thick, fleshy leaves are long and narrow, and the plant increases from seed and is valuable not only for the above situations, but for thriving in mud flats and salt marshes.

Purple Echium (*E. violaceum*) is a highly conspicuous and ornamental occupant of sandy and stony wastes by the seaside. The highly coloured flowers are larger and showier than those of the common echium (*E. vulgaris*), which is also a capital seaside plant, and render the purple species one of the brightest occupants of land by the seaside.

With many of the above native plants we have been successful in propagating by seed-sowing in the positions they were intended to grow, and in a case along the coast of Wales a barren waste that extended for about two miles in length was successfully dealt with in the matter of both seed-sowing and transplanting clumps of the desired plants from districts where they grew wild.

Amongst grasses the following are recommended for growing by the seaside:

Phleum arenarium, the sand phleum, is an erect annual, 6 or 8 inches high, that grows freely along the coast of England, and is recommended for planting in such situations.

Carex arenaria, the sand carex, grows about a foot in height, with a running root-stock that often extends to a couple of yards in length, and is valuable for fixing shifting sands. It is a common grass all around our coast, and is of considerable value as thriving in pure sand and in the most exposed situations.

The Sea Scirpus (*S. maritimus*) occurs in plenty all along our coast, and is valuable as thriving in salt marshes where only a limited number of plants could succeed. The triangular stems often rise to 4 or 5 feet in height.

The Sea Rush (*Juncus maritimus*) occurs on many parts of the English coast, and is a valuable plant for growing in maritime sands.

The rigid stems rise together in tufts that often exceed a yard in height, and quite cover the sandy ground where they find a footing.

At Burnham-on-Sands the number of native and alien plants that succeed along the coast is quite remarkable. The soapwort (*Saponaria officinalis*), often with double flowers; *Asparagus officinalis; Medicago sativa;* the flixweed (*Sisymbrium Sophia*); *Convolvulus Soldanella,* with thick, leathery leaves; patches of *Iris fœtidissima,* with its handsome orange seeds; *Epipactis palustris,* near swampy ground; also *Orchis latifolia* and *O. maculata,* are all found in abundance. Most of our ordinary sand-dune plants are to be found here, such as the well-known yellow-horned poppy, *Cakile maritima, Euphorbia paralias, Violas* (several), *Arenaria syrpyllifolia, Chenopodium, Atriplex, Beta maritima,* and *Galium verum maritimum.*

Amongst grasses we noticed were carex, several species, and the great spiny grass, *Ammophila arundinacea, Phleum arenarium, Festuca uniglumis,* and galiums in abundance. Salicornia, chenopodium, salsola, sucœda, and *Honckenya peploides* all occur on the stretch of sands within reach of the highest tides. Quite interesting is the flora of the mud flats at the mouth of the River Brew, where we saw *Aster tripolium, Glaux maritima, Artemesia maritima,* and statice and bupleurum in abundance. The sea buckthorn, which was planted on the sand-hills about 1890, has been found of great value in binding the shifting sands.

CHAPTER IX

COST OF SEASIDE PLANTING

THIS will vary greatly with the quality of soil, exposure of the ground, and whether a shelter screen has been erected.

Along the Welsh seaboard, where fully exposed to the storms blowing in from the Atlantic Ocean, the writer formed several plantations on different classes of soil thirty-two years ago. In one case the ground with a frontage of 500 yards was flat, rising gradually from sea-level to 50 feet at half a mile inland. During stormy weather sand in small quantities was carried landward for about 200 yards, for which distance the soil might be said to be composed of almost pure sand on a stony or gravelly bottom. A shelter fence 4 feet high, consisting of two cross-bars nailed to uprights placed at 9 feet apart and thatched with gorse, was erected along the sea-front just above high-water mark.

Immediately to leewards the Austrian, maritime, and Corsican pine were planted in treble rows 4 feet apart and 4 feet from plant to plant, the intervening spaces being sown down

with seeds of the yellow and white broom, gorse, and sea matweed. Inwards the Scotch pine, sycamore, elm, white poplar, goat willow, and several other kinds of trees that were found to succeed along the coast were planted. Owing to the sandy nature of the ground trenching was found unnecessary, and instead pits 2 feet in diameter and 18 inches deep were opened for the reception of the plants, the bottom of each pit being thoroughly loosened but left in position.

The shelter fence, as timber and brushwood was readily obtained from the adjoining ground, cost 4d. per yard run, and opening the pits 3s. per 100. The trees were procured from the nursery on the estate, and the planting was done by the estate workmen. The whole cost of forming the plantation, including wind barrier, pitting, and planting, was £7 15s. per acre.

A few hundred yards from this plantation another was formed, but, owing to the quality of the soil, the cost was much greater. In this case the soil over the whole area was a black peat, or what is locally known as a mud flat, and required to be both drained and trenched. At high tide, and especially during stormy weather, this land was subject to the spray from the sea and fully exposed. The total cost of drainage, trenching to 18 inches in depth, and planting was £12 per acre. The trees that did best in this case were the goat willow, white poplar, Austrian pine, tamarisk, and broom. *Spartina stricta* and *S. Townsendii* were used with good effect in covering the dampest and most exposed parts of the ground.

Ten years ago the writer formed some plantations on the

high-lying chalk cliffs by the seaside near Dover Castle. As these plantations were primarily intended for shelter, the main object was to get the trees up quickly, and as the work has been attended with marked success the following account of forming these plantations will be interesting: The soil consisted of good yellow loam from 6 to 12 inches deep, resting on a bed of hard, solid chalk, which it was found necessary to thoroughly break up before planting was engaged in. Trenching to a depth of 18 inches was done all over the ground, the bottom chalk being broken up another 4 inches, the loamy soil being kept on the surface. The trees planted were the Austrian and Corsican pines around the margin, with the Scotch and mountain pines, the scyamore, elm, beech, beam tree, and mountain ash. Shrubs included the sea buckthorn, dogwood, golden elder, mahonia, box, snowberry, and guelder rose. The cost of forming this plantation was:

Trenching	...	...	...	£20 per acre.
Planting	...	...	...	£7 „

Any deaths amongst the newly planted trees were made good by the contracting nurseryman, but very few occurred. The trees have done remarkably well, the outer line of Austrian pines, averaging 12 feet in height, and owing to plenty of space being allowed for branch development, they are thickly furnished to ground-level, and afford a great amount of shelter to the other trees and the adjoining grounds. Some of the Austrian pines are now 16 feet 8 inches in height.

At St. Margaret's Bay the writer also formed several plan-

tations on high ground about 50 yards from the sea. The soil was loam, of fair quality and depth, resting on chalk. Owing to the depth of soil pitting only was resorted to, and with the trees the cost per acre worked out at £8 5s. Here the Austrian was largely planted, also the Scotch, sycamore, elm, willow, and poplar. All the trees have grown rapidly, and the plantations are a source of comfort and shelter to the residents of that part of the coast of Kent.

On the fully exposed east coast of England, where the soil was mainly composed of sand resting on a gravelly bottom, the cost of forming several large plantations averaged £9 per acre. Pitting was done by contract at 2s. 6d. per 100, but planting was carried out by the estate workmen. Only on one area of the land planted had a shelter fence to be erected, which was formed of larch posts with a double line of stout fencing wire and thatched with spruce branches. It cost 3d. per yard, and was 5 feet high. An interesting and cheap experiment was made along a sandy waste by the seaside on the East Coast. The ground was not a shifting sand, but partly covered with various grasses, the horned poppy, and a strong-growing trefoil. At stated distances apart patches of the ground averaging 18 feet in diameter were forked over, soiled from an adjoining field, and sown down with the seeds of broom, gorse, and sea matweed. These patches, which were protected by sheep-hurdles, were quickly covered with seedling plants, which during the second spring were thinned out to 8 inches apart. The cost of preparing the ground and sowing came to 30s. per acre. At present the broom is 10 to 12 feet high, and

between the various patches young trees of the maritime and Austrian pine were introduced and have grown freely. The whole forms a capital covert for game, an excellent shelter, and has greatly improved the landscape appearance of the district.

On the coast of Norfolk the cost of tree planting, including trenching, fencing, plants, and planting, averaged £10 per acre. In France seaside planting cost £8 per acre, and in Belgium about the same amount.

The Culbin sands, which lie between the mouths of the Nairn and Findhorn, were saved by planting the maram grass at a cost of 27s. per acre, the grass being transplanted from places where it grew thickly. Spruce branches were laid along the planting boundary, which acted as a shelter on the windward side until the grass got a footing.

The cost of planting on the Margam Estate, South Wales, referred to in Chapter I., was very low, hundreds of acres being dealt with at about 8s. per acre, and for several seasons 200 acres per year were planted. This method was found by far the cheapest and most satisfactory of any that had been tried, and a verdant surface now takes the place of what at one time were bare, sterile, and unsettled wastes of fine, drifting sand.

Even in the warmest weather, when the sand feels hot to the touch, and during prolonged drought the maram grass remains healthy and green, the result of the roots reaching far down into the sand.

CHAPTER X

RETURNS FROM SEASIDE PLANTING

FROM a strictly commercial point of view, or the value of timber produced, seaside planting, particularly on sandy, exposed wastes along the coast, can hardly be considered in the light of a profitable investment. The value of timber grown in such places is, however, not the main point to be considered, as the shelter afforded to residential property and to the adjoining cultivated lands can hardly be overrated, and is frequently of even greater importance than the quantity and quality of the wood that is produced.

That profitable timber culture has, however, been carried out on exposed sandy and gravelly wastes by the seashore there are many examples in our own country, though these are insignificant when compared with what has been done in a similar direction by the Governments of France, Belgium, Holland, and other Continental States. The reclamation of large areas of shifting sands in the South of France affords an object-lesson of what may be done by perseverance and planting the right kinds of trees, and the same applies in the case of the Belgian coast, where con-

siderable tracts of what were previously blowing sands have been successfully converted into thriving and profitable plantations. In both cases a considerable annual revenue is obtained from the produce of these seaside woodlands, while the shelter afforded to man and beast can hardly be over-estimated.

A hundred years ago the French coast was a dreary, howling wilderness of constantly shifting sands that were fast invading the cultivated lands in the interior, but now it is covered with thriving plantations from which the French Government annually receive about a million pounds sterling for timber, fire-wood, and minor products of the woodland. The Belgian sea-side plantations have also been a financial success, whether for the timber they produce or shelter they afford.

Around the coast of the British Isles many successful planting schemes could be pointed out on ground that was worthless for agricultural purposes. At Holkham, in Norfolk, very successful planting operations along the sea-coast have taken place during the past fifty years. The soil here is most unkindly, but by careful manipulation and planting, many kinds of trees now flourish on what previously were dreary expanses of coast-line.

These plantations extend for several miles along the Norfolk coast, and are fully exposed to the German Ocean. Inwards the land is now of considerable agricultural value, but coastwards, previous to planting, the sandy soil was mainly used as a rabbit warren. Two grasses have been largely employed in binding these sandy wastes, the lyme grass (*Elymus arenarius*) and the

maram (*Psamma arenaria*). The trees used were the Austrian, Corsican, Scotch, and maritime pines. Plenty of room for the development of the side branches was allowed, the consequence being that the Austrian and maritime pines formed bushy specimens that afforded shelter to the Scotch and Corsican.

About three-quarters of a century ago several plantations were formed on the northern cliffs close to the Yarmouth Roads. The elevation ranged up to 300 feet above sea-level, and the soil was for the most part poor on a gravelly bottom. Trenching the ground was resorted to, and shelter fences were erected on the most exposed situations. The plantations were a success, the trees that were found best suited for this elevated seaside position being the maritime and Austrian pine and several species of willow. Inwards many other timber trees have done well, and the thinnings have realised a considerable amount.

On the Culbin sands, which occupy the north-western corner of Morayshire, tree planting has been most successfully engaged in, and thriving woods now cover several thousand acres of what seventy-five years ago were stretches of drifting sand. By planting lines of the Austrian, Corsican, and cluster pines along the exposed margin many plantations of the larch and other valuable timber-producing trees have been successfully raised along the coast of Carnarvonshire and other parts of the Welsh seaboard. Some of the larch and ash planted thirty-five years within a hundred yards of the sea were sold at 11s. and 13s. respectively. The ground was low-lying, the soil a gravelly loam inclined to peat, and fully exposed to the direct winds from the Atlantic.

But all along the coast-line from Bangor to Penmaenmawr there are thriving plantations, some of which are not 20 yards distant from high-water line. These were planted from fifty to sixty years ago, and many of the trees are at present worth 32s. each, particularly the ash and sycamore.

On the coast of Kent we formed several plantations within 50 yards of the sea twenty-seven years ago. Overlying the chalk formation was a thin deposit of loam. Along the shore side of these plantations the Austrian, Corsican, and Scotch pines were thickly planted, and inwards sycamore, ash, birch, and elm. The trees generally have succeeded well, and at present average 21 feet in height, and the thinnings have been sold at 35s. per dozen. The average cost of forming these plantations was £7 per acre.

In the extreme North of Ireland, where fully exposed to the Atlantic storms, several examples of successful tree planting could be pointed out, and in one instance, though the plantation had been partially neglected, the larch and ash, after being planted for twenty-seven years, sold at 10s. each. Here the Austrian and other pines were planted to the seaward of the plantations in treble lines.

Near the shores of Lough Neagh are several thriving plantations that were formed in peat bog forty-five years ago, the cost of which averaged £4 18s. per acre. The larch, Douglas fir, black and common spruce have all done well, and are at present being sold at 16s. each. In Scotland, along both the East and West Coast, we have returns from seaside planting on four

estates, and although these vary considerably they all point to the fact that successful timber culture has been engaged in in each case.

Along the Firth of Forth there are good examples of tree culture to be met with, and some of the larch plantations that were formed behind a screen of the Austrian and other pines have been a financial success.

In only a few cases, however, has a strict account of the cost of forming such plantations been kept, so that actual results in the profit and loss way cannot be accurately ascertained.

The age of the trees and present selling price will, however, be a guide as to the commercial value of plantations that have been formed on the seaside.

Sand-Dunes and Rabbit Warrens.—Reclaimed shifting sands by the seaside have in many instances been most profitably utilised as rabbit warrens. This is especially the case where the maram or sea matweed has been planted, as rabbits are particularly fond of this grass when young and tender. So fond, indeed, are they that considerable difficulty was experienced on a seaside estate in South Wales in getting this grass established, and in order to do so wire fencing had to be resorted to. Now, however, the maram has taken possession of the sand-dunes and increased to such an extent that the constant nibbling of the rabbits is a question of small moment. Similar experience was communicated from Norfolk and other parts of the coast where the maram was being planted in order to fix the moving sands. In each case, though difficulty was at first experienced in keeping the

rabbits in check, after the ground had been thickly carpeted with the grass no further annoyance was reported. These consolidated, grassy sand-dunes, being dry, make excellent cover, and are much frequented by rabbits, which afford good sport and return a considerable item of profit to the owner of the land. The Belgian sand-dunes are similarly utilised as extensive warrens, and as rabbits thrive well by the seaside and are constantly in demand as food the profits attending their occupation of such grounds are found to be considerable.

CHAPTER XI

INSECTS AND FUNGI INJURIOUS TO SEASIDE TREES

CERTAIN trees and shrubs, when planted by the seaside, are liable to the attacks of insects and fungi, probably owing to the mild, humid atmosphere fostering their increase during the breeding season. Hardwooded species fare worst in this respect, though several members of the pine family are by no means immune from attack. The great preventive to insect and fungoid attacks on trees and shrubs is keeping the woodlands free of dead and dying wood by burning all brushwood, bark, and trees that have been attacked or appear in an unhealthy condition.

Dead or sickly trees should never be allowed to remain in the woodland, for they are a direct incentive to the spread of insect and fungi life in providing the most suitable breeding-grounds. We have known isolated pines, particularly the Austrian and Scotch, to get infested by insect pests when grown by the seaside; but such attacks are not serious, and may in most cases be got rid of by careful attention to the individual trees in the matter of hand picking and spraying.

The Pine Beetle (*Myelophilus piniperda*) often attacks the Austrian, Scotch, and other members of the pine family when growing by the seaside; but, unless in a few cases, the injury done is rarely great, though we have had the Austrian in particular damaged over a wide area by the attacks of the pine beetle.

Healthy trees, too, are by no means free from attacks, nor are single specimens that have plenty of room for development, as was lately instanced on the chalk cliffs of the coast of Kent. The injury done by this beetle consists in its destruction of the leading shoots, and consequent lessened vitality of the trees it attacks. The beetle enters by boring a hole into the side of the main shoot or branch until it reaches the pith, after which the course is directed upwards and an exit made at the terminal bud. This tunnelling, which usually extends for a foot in length, so weakens the shoot that it frequently gets broken over during stormy weather. Collecting and burning the attacked shoots, both on the tree and ground, as well as all dead and dying wood in the vicinity, is the only remedy—work that requires to be done with the utmost care to prevent the escape of the wary insect. The beetle is black, and about $\frac{1}{8}$ inch long.

The Goat Moth (*Cossus ligniperda*) is a frequent enemy to forest and fruit trees growing by the seaside, and would appear to be greatly on the increase. Elm, ash, willow, *Pyrus* and thorns of various kinds suffer most by the grub boring into the timber, which, in the case of young trees, renders it so weak that the shoot or branch readily gets broken over either of their

own weight or during stormy weather. The holes or tunnels are of large size, almost circular in shape, often fully ½ inch in diameter, and should be plugged with cotton-wool steeped in cyanide of potassium, the fumes from which speedily kill the grubs. Tar injected into the tunnels is also to be recommended. As is well known, the goat moth is a formidable insect, while, being one of the most destructive, its ravages are much dreaded.

The Wood Leopard Moth (*Zeuzera æsculi*) frequently attacks the horse and sweet or Spanish chestnut, as also the ash, when growing by the seaside, and at Hythe and other seaports of Kent, many trees have been injured of late years. The caterpillar of this beautiful moth is very destructive to the timber of various trees into which it bores, thus rendering the wood comparatively valueless for the uses to which it is applied. Three years are required for the caterpillar to arrive at maturity, at which period it is fully 2 inches long. Both in form and colour the leopard moth is particularly elegant, the head and thorax being covered with a thick, white pile, the body with a black down fringed with white at each joint. The wings are white with yellowish-brown veins, and a row of rounded bluish spots between each two. As in the case of the goat moth, plugging the holes made by the caterpillar with a piece of tow dipped in gas-tar or placing cyanide of potassium on cotton-wool and inserting it in the tunnels is the best way of destroying the grub. By using a bent wire the grub can often be removed from the holes, and this is the method that is mostly adopted in the London parks.

The Beech Coccus (*Cryptococcus fagi*) often attacks trees

growing by the seaside, though not probably to the extent that it does in inland situations. It is a small yellow insect, about $\frac{1}{25}$ inch in length, wingless and legless, and it effectually shields itself by constructing around it a white, waxy substance not unlike cotton-wool, and which imparts to affected specimens the appearance of being dusted with flour. These insects multiply in enormous numbers, and, having attached themselves to a tree, suck the juices of the cambium layer. Where the insect abounds the beech soon begins to show signs of the attack in the thin foliage, peeling of the bark, and, when the attack is aggravated, the death of the tree. Hundreds of beech trees have succumbed to the attack of this pest in Hertfordshire and other parts of England, and on the West Coast a whole plantation of the tree fell a victim to this insect. The historic Burnham Beeches, which a few years ago were in danger of destruction by the coccus, have fortunately been saved by spraying with paraffin and soft soap, an almost impossible remedy where the trees over a large area are affected. Single specimens may be treated by simply scrubbing the affected parts with carbolic soap.

Oak Leaf Roller Moth (*Tortrix viridana*).—Where oak trees are cultivated by the seaside this insect is usually present about the beginning of June—in fact, is rarely absent from maritime plantations. Where only a single or few oaks are attacked spraying with a weak paraffin solution may be resorted to, but hardly any remedial measure can be adopted in a clump or plantation of trees. Starlings, rooks, and other birds destroy vast numbers of this pest, and should be encouraged, especially the starling.

The Elm Tree Destroyer (*Scolytus destructor*) is usually abundant, and is quite a pest to trees growing by the seaside, particularly when these are in unfavourable soils and situations. The beetle is $\frac{1}{5}$ inch long, stout and cylindrical, and usually confines its attacks to the elm. In June it bores into the inner bark, forming galleries along which the eggs are deposited. Trees infested by this beetle have an appearance as if the bark had been riddled with shot. Fortunately old and unhealthy trees are most frequently attacked, though vigorous young trees are by no means exempt from injury. In order to confine the spread of this insect cutting down and burning badly affected trees is to be recommended. Less severe cases may be dealt with by an application of tar, and by removing all loose bark and painting the wood with creosote much good will result.

The Spruce Gall Aphis (*Chermes abietis*).—This is a common insect by the seaside, and one that renders many fine young spruce trees very unsightly by reason of the cone-like excrescences that are formed by the action of the insect on the shoots of the infested specimens. The formation of this curious excrescence is brought about by the female aphis piercing with her beak, or sucker, one of the buds and drawing off the sap, the consequence being an unusual conical-shaped growth at that part.

When the young larvæ appear they also, by piercing the gall, extract the juices, and the gall, enlarging soon, causes the larvæ to become embedded at the base of the leaves, which by this time have become curiously malformed. The insects are scarcely

$\frac{1}{10}$ inch long. Most seaside plantations where the spruce is cultivated suffer from attacks of this aphis, and at St. Margaret's Bay and other places on the South Coast the attacks were persistent for many years.

The only remedy is to collect the cone-like excrescences and have them destroyed—a by no means difficult operation, as young trees are usually attacked—and in the case of badly infested trees felling and burning both timber and brushwood should be resorted to.

The Thorn Fly (*Aphis Cratægi*) is common in tree nurseries by the seaside, and attacks whole hedges or brakes of quick. As a rule, the younger and more healthy plants first fall a prey to its depredations.

Spraying with tobacco-water or almost any of the prescribed insecticides will rapidly exterminate the fly; but such work is laborious and expensive when a large brake or long hedge of the thorn has to be gone over.

The Cockchafer (*Melolontha vulgaris*) is usually abundant on seaside trees, particularly in warm, sheltered situations, and does most damage by eating the leaves of the sycamore, beech, oak, cherry, and many other trees. It will also eat the roots of most young trees, but those of the pines in particular.

This formidable insect is about $1\frac{1}{4}$ inches long and of a chestnut-brown colour on the upper part of the body, while the head and some other parts are of a bronzy green and thickly covered with yellowish-white hairs.

In April and May the eggs are laid in a hole in the ground

about 5 inches deep, and the grubs are hatched in July. They are of a dirty yellowish-white colour, and the skin much wrinkled. In this state, however, they do but little harm ; but, after having changed their skins and remained in a torpid state during winter, come to the surface in spring and eat the roots of almost any trees or plants that come in their way. They burrow deeper at the approach of winter, coming to the surface again in spring, and, when full grown, are about $1\frac{1}{2}$ inches long and almost $\frac{1}{2}$ inch in diameter. The perfect insects do not live more than about twelve days, and are easily known by their heavy, awkward flight towards the evening. Elm trees by the seaside are usually attacked by this insect, which is abundant along most parts of the coast-line. Destroying the grubs is the only remedy.

The Holly Fly (*Phytomyza aquifolia*).—The foliage of the holly, when growing by the seaside, is frequently very much disfigured by the grubs of the holly fly, which burrow beneath the upper skin of the leaves, feeding on the internal substance. This imparts a blistered and discoloured yellowish appearance, which in the case of ornamental varieties is anything but desirable. Probably no great damage to the infested trees is brought about, but the wholesale injury to the leaves, as is often the case, cannot but weaken the plant, and certainly renders it unsightly.

About May the flies make their appearance, and lay their eggs beneath the upper skin of the leaf, from which the grubs, about $\frac{2}{10}$ inch long, are hatched. These work their way beneath the skin of the leaves, forming small tracks of a more or less circuitous shape, terminating in large and unsightly blisters.

They quit the leaves about March by making small holes in the skin of the leaf, and afterwards become chrysalides. The fly is small and inconspicuous.

Picking off and destroying affected leaves or crushing the grub by pinching the blisters are ways of lessening the attacks, and dusting the trees with hellebore in early spring has also been successfully resorted to.

"Witch's Broom" on the willow is caused by the attacks of a mite insect, *Eriophyes triradiatus*, which has increased rapidly in the London area in particular during the past ten years. Seaside willows are very liable to be attacked, especially the white, crack, Bedford, Huntingdon, and several of the hybrid forms. On some of the trees hundreds of the moss-like growths are to be found, these, which are of all shapes, varying in length up to 15 inches. Trees that are badly attacked soon present an unhealthy appearance, and in several instances have succumbed to the impoverishing influence of the insect. As far as is known, the insect was first reported on by the writer from Regent's Park about ten years ago, since which time it has spread with terrible rapidity.

By the seaside, particularly along the South and West Coast, the insect has appeared, and few willow trees are free from its attacks. Several methods have been tried in order to get rid of this pest, the most successful being to prune off and burn all attacked branches—a remedy that has been attended with good results. In a few instances that have come under our notice, especially in the London area, the affected trees have gradually succumbed to the insects' attacks.

Witch's Broom on Willow.

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Fungi.

The Larch Disease is frequently found in sheltered sea-side plantations, particularly when the soil is inimical to their growth. In all probability the larch disease or larch canker owes its origin to the minute spóres formed in the fructification of the now well-known fungus, *Peziza Willkommii*. It has been pretty conclusively proved—in fact, is now an established fact—that these spores can only find a footing where the rind of the bark has become in some way injured, such as might be occasioned by the puncture of an insect, by wind, accidents when pruning or thinning the plantations, frost, or from any other cause. The spores send down their germ tubes into the cambium, between the bark and the wood, where the moisture and nourishment that is afforded cause rapid development of the fungus. This soon spreads to the cells of the wood, and the annual layers either entirely cease to grow or become disorganised and crippled in growth, causing a scar or hollow appearance to the stem at the point of attack. The surrounding bark, by its attempts to heal over the wound, causes a thickened or swollen appearance of the trunk, thus imparting to affected trees the cankered and distorted look that is so distinguished a characteristic of this disease.

The canker appears on the larch, both common and Tyrolese, at nearly all stages of growth up to about thirty years, but rarely after that age. The timber of affected trees is valueless for constructive purposes.

We have examined a plantation by the seaside of only four

years' growth that was sadly infested by the Peziza, whereas, in other cases, the trees may be twelve to fifteen years old before being attacked.

The Sycamore Fungus (*Rhytisma acerinum*).—Dwellers by the seaside, but, indeed, everyone interested in trees, must be familiar with the conspicuous black, pitch-like spots which in certain seasons so mar the appearance of sycamore leaves. These are due to the above-named fungus, which, appearing as small yellow spots on the under-side of the leaves towards the end of June, gradually increase in size and depth of colour until they attain to fully $\frac{1}{2}$ inch in diameter and are pitch black and shining, with a margin of dirty yellow. The attacked portion of the leaf becomes wrinkled, contorted, and much thickened in texture, the affected foliage dropping off prematurely. After lying on the ground during the winter the thread-like spores of this fungus are produced in large quantities, and attack the foliage of the sycamore when appearing in May or June. The sycamore is not the only tree affected by this fungus, for the Norway and sugar maple and our native species are equally liable to attack, and have in some instances suffered very severely from this cause. The fungus is becoming more plentiful though erratic in its periodical attacks, and disfigures the maple and sycamore leaves to a wide extent.

Rhytisma punctata may at once be distinguished from the above species by the many small black spots studded thickly together, which combine to form the large conspicuous blotches for which affected trees are remarkable. Both species are some-

Beech killed by Fungus.

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times found on the same leaf. As the attacks of this fungus continue from year to year, and cause almost every leaf to drop off prematurely, the health of the affected tree is impaired, and it becomes an easy prey to the equally destructive coral spot fungus, *Nectria cinnabarina*. By burning the leaves affected with *Rhytisma* before the spores are liberated in spring the spread of the fungus is prevented in a simple and effective manner. The sycamore fungus is very plentiful on trees around London, as well as at the sea-coast.

Other troublesome fungi are *Stereum purpureum*, which attacks beech and elm; *Polyporus sulphureus*, frequenting the oak and some species of poplar; *Daldinia concentricus*, the ash and a few other trees; and that commonest of all by the seaside, *Polyporus squamosus*, which attacks diseased elms and appears in horizontal table-shaped masses often 18 inches in diameter. The accompanying illustration shows a beech tree that has been killed outright by *Stereum*.

By removing the fungi and painting the affected part with carbolineum or creosote much good will result.

CHAPTER XII

CHOICE OF TREES AND SHRUBS

IRRESPECTIVE of the quality of soil, the following lists include such trees and shrubs as have from long experience been found most suitable for withstanding the effects of the sea-breeze.

They are arranged in the following order:

I. Such as can stand the first brunt of the storm;

II. Such as can withstand the sea-breeze when partially sheltered; and

III. Such as thrive satisfactorily when sheltered from the direct sea-blast and effects of salt spray.

I.

Trees.	Shrubs.
Pinus Pinaster.	Tamarix gallica.
„ Laricio.	„ germanica.
„ „ austriaca.	Hippophaë rhamnoides.
Quercus Ilex.	Sambucus nigra.
Salix caprea.	Salix repens.
Acer pseudo-platanus.	Corylus Avellana.
Pyrus Aucuparia.	Lycium europæum.
Populus canescens.	Juniperus communis.
Laburnum vulgare.	Cotoneaster Simonsii.
Ulmus montana.	Euonymus latifolia.
Cratægus oxyacantha.	Spartium junceum.

II.

Trees.	Shrubs.
Alnus glutinosa.	Shepherdia argentea.
Salix viminalis.	Rhamnus catharticus.
„ alba.	Ribes sanguineum.
Fraxinus excelsior.	Viburnum plicatum.
Cupressus macrocarpa.	Baccharis halimifolia.
Pinus montana.	Rosa spinosissima.
Acer platanoides.	Escallonia macrantha.
Populus alba.	Arbutus Unedo.
Prunus Padus.	Colutea arborescens.
Quercus Cerris.	Halimodendron argenteum.
Thuya occidentalis.	Cotoneaster microphylla.
Pinus insignis.	Atriplex halimus.
Pyrus Aria.	Calophaca wolgarica.
Salix cœrulea.	

III.

Trees.	Shrubs.
Juniperus virginiana.	Berberis vulgaris.
Pinus halepensis.	„ empetrifolia.
„ Banksiana.	Hydrangea hortensis.
Betula alba.	Cornus sanguinea.
Cedrus atlantica.	Viburnum tinus.
Populus nigra.	Veronica, "Little Gem."
„ tremula.	Daphne laureola.
Thuya gigantea.	Laurus nobilis.
Cupressus Lawsoniana.	Hollies, various.
Carpinus betulus.	Ruscus aculeatus.
Pinus sylvestris.	Ulex europæa.
Abies excelsa.	Syringa vulgaris.
Juniperus drupacea.	Buddleia globosa.
Castanea vesca.	Ceanothus Veitchianus.
English maple.	Osmanthus ilicifolius.
Juniperus chinensis.	Aucuba japonica.
	Symphoricarpus racemosus.

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